Micro PAVER Version 5.0

User Manual

PAVER

5.0

US Army Corps
of Engineers

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US Army Corps of Engineers

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US Army Corps of Engineers CERL

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Required/Recommended Hardware

Required Hardware

200MHz processor

32MB RAM

Microsoft Windows 95/98/2000 or Windows NT

130MB space needed for installation

Recommended Hardware

Fastest processor available

256MB RAM

MS Windows 98

Updating to Micro PAVER 5.0

For Micro PAVER 4.x users, the conversion to Micro PAVER 5.0 is an easy procedure that can be split into a few simple tasks. These tasks include: importing e40 files into PAVER, updating GIS coverages created in PAVER 4.x, and updating some of the system tables in PAVER 5.0.

Updating the Database

The first step is to import the databases created in PAVER 4.x into PAVER 5.0. This update is done using the same Import/Export tool that was featured in previous versions of PAVER. For information on how to import the e40 files see *5.0 Import Procedure* on page 31.

Updating the GIS coverage

Converting PAVER 4.2 coverages to 5.0 is a simple two step process. The first step is to convert the coverage (*.cov) file to a shape file (*.shp) in ArcView. Once you have the shape file, you must use the **Shape File Converter** located under the **Add-Ins** menu in PAVER 5.0. For more information on the shape file conversion, see *PAVER Shape File Converter* and *Converting from 4.x to 5.0* on page 109.

Updating System Tables

In the conversion process between PAVER 4.x and 5.0, some of the system tables in version 4.x do not import changes into PAVER 5.0. If changes or additions were made to the tables in version 4.x you must re-enter the values. The tables that do not import are: **Materials**, **Unit of Measure (Field) Settings**, and **Inventory Pick Lists**. These tables can all be found under the Tables menu in PAVER 5.0. It is recommended that you print out the tables in PAVER 4.x to make the data re-entry process faster. For more information about the *Inventory Pick List* see page 41, and for more information about the *Materials* and *Unit of Measure (Field) Settings* tables see page 46. All the information is located in the *System Tables* chapter, pages 39-46.

Micro PAVER v5.0 Improvements

Micro PAVER 5.0 has numerous improvements over its predecessor. The first area of improvement is in the **System Tables**, which are used throughout Micro PAVER regardless of database. The second area of improvements is in the **Visual Menu** components, which, when used, are particular to specific databases. The following list outlines many of the important improvements made to the program.

<u>System Tables</u>

Define User Fields > **Additional User Fields**: Allows the user to define user-specific fields.

M&R Plan Tables > **Major M&R** > **Tab 5**: This is a **Priority Table** that is a function of branch use and section rank. Branch use priority and section rank priority are defined by tabs 3 and 4, respectively.

Condition Tools >

- **Define Condition And Age Categories**: This allows the user to define ranges for conditions and ages to be used in all reports including summary charts and condition analysis.

- **Select Condition Types**: The user selects conditions that will be shown throughout Paver, i.e. summary charts, condition analysis, etc…

- **Define User Distress Indices**: The user defines any distress index for any selected groups of pavements. It is important to calculate the index for all sections--this can be a long process that may take up to an hour.

<u>Visual Menu</u>

Selectors: Various selector functions are now available. The combination of **Tree** and **GIS** is used in the **Selection** button on the **PAVER Button Bar**. Making a selection using any of the tools is reflected throughout the system. The selection tools serve as a broadcast system.

Inventory > **Copy and Move Data**: Allows the user to move work history and inspection data among inventory items.

Inventory > Definition > 3. Section Tab > Conditions/Families: Allows user to view the condition and family assignment for any given section. This function is also available as a new tab on the Inventory\Sections tab.

Reports: There are two new options for reports.

- **Flexible Report**: Allows the user to select what columns are used in the report. Select **Create New Report** to select what columns are included in the report. To choose the columns, highlight the table from the tree with the desired columns. Then select the desired column from the left-hand-side window and move it to the right-hand-side window.

- **GIS Reports**: These provide inventory and PCI data reports.

Condition Analysis > **Condition Analysis Report**:   Part of the output includes GIS views.

M&R >

- **M&R Plan**: On the **Plan Mode** tab, the user selects either **Determine Budget Consequence** (identical to Micro PAVER v4.2) or **Determine Budget Requirements** (new feature).

    - The budget requirement feature allows the user to eliminate backlog in the number of years specified for the plan. The number of years is specified under the **Timing** tab. This is used by clicking the **Backlog elimination in X years** option.

    - The budget requirement feature can also determine the budget required to maintain the current PCI or achieve a desirable PCI in the number of years for the plan. This is used by clicking the **Condition Stabilization** option.

- **Policies and Costs**

    - The user can apply localized policies in the first year as in Micro PAVER v4.2

    - Or you can simply use M&R cost by condition for all years (new). The user may select the major M&R start year and when the user selects a date for major M&R later than the plan start year, you can also select to show the backlog during the time as well. This feature is useful in determining the consequence of no major M&R for a specified time period.

There are also many reporting improvements located throughout the system. Some final things to note: For added convenience, Micro PAVER v5.0 allows the docking of windows. This is accomplished by right clicking the diamond icon on the window desired to be docked. Another added feature is on the **PCI Inspection** form. When you right click on a distress, the distress manual and a description of the distress along with images appear.

Overview

Introduction to Micro PAVER

Micro PAVER for Windows V5.0 (herein referred to as PAVER) is an automated pavement management system (PMS). It is a decision making *tool* for the development of cost effective maintenance and repair alternatives for roads and streets, parking lots, and airfields. PAVER provides you with many important capabilities, including:

- Pavement network inventory

- Pavement condition rating

- Development of pavement condition deterioration models (Family Curves)

- Determination of present and future pavement condition (Condition Analysis)

- Determination of maintenance and repair (M&R) needs and analyzing the consequence of different budget scenarios (Work Planning)

PAVER Organization

> **Note**
>
> The nine buttons on the **PAVER Button Bar** are arranged to reflect the logical sequence of pavement management.

The main features of PAVER are accessible from nine buttons arrayed across the top of the **PAVER Desktop**. The buttons have been arranged to reflect the logical sequence of pavement management. They initiate the most frequently used features in PAVER. Additional features are accessed through the **Visual Menu**.

This button array is referred to as the **PAVER Button Bar**. By clicking one of the buttons, you launch one of ten principal PAVER components. These components are:

Inventory Data (Inventory)	Inventory data entry and summary charts
Work Information (Work)	Work required and work history
PCI Inspections (PCI)	Field inspection data entry
Reports	PAVER reports and summary charts
Prediction Models (Pred. Modeling)	Build and assign condition prediction models

Condition Analysis (Cond. Analysis)	Condition analysis report
M&R Plan	Maintenance and repair planning report
Selection	Pavement selector using GIS
Visual Menu	A detailed menu with all PAVER options

Like other Windows programs, additional program features are accessed from the drop down menus located above the **PAVER Button Bar**. The **PAVER Menu** provides standard Windows features such as file and print services (**File New, File Open, File Combine/Split, Print, Printer Setup** and **Exit**), editing (**Cut, Copy** and **Paste**), and Windows management and help.

The **PAVER Menu** also provides specialized PAVER options for accessing and editing system tables (**Tables**) as well as changing the units of measure from English to Metric (**Preferences**).

PAVER Button Bar ——
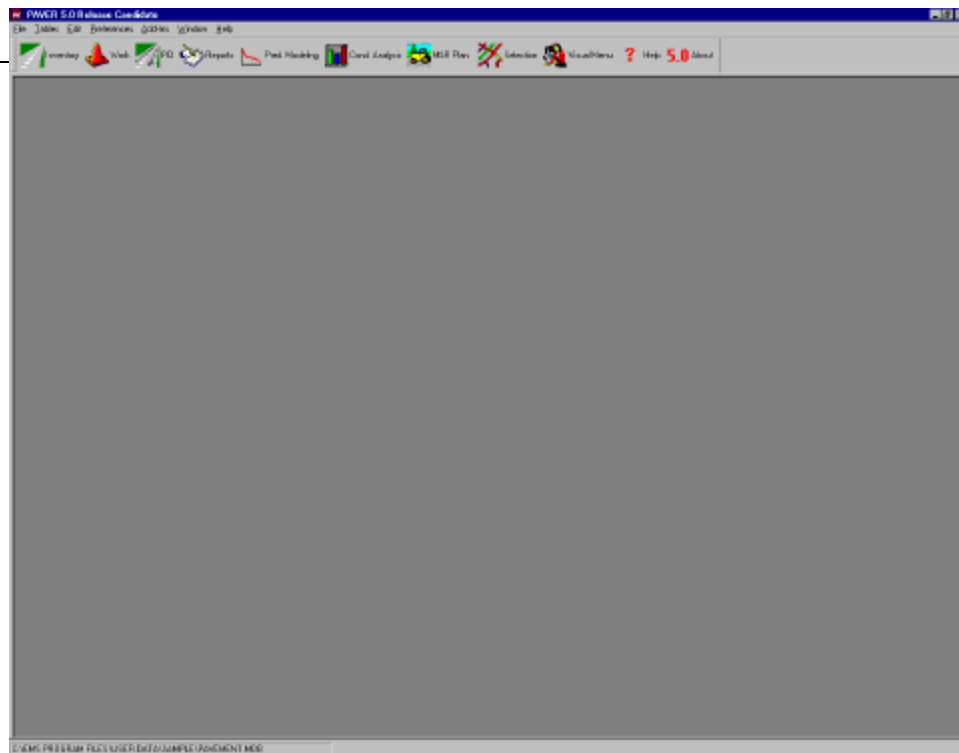
Operating Features

Basic PAVER Features

PAVER introduces several new **Engineered Management System (EMS)** tools: **EMS Query, Report Viewer, Right Button Click on Tables, and Right Button Click on Graphs.** The PAVER program is designed using commercial Windows components and the user interface follows standard Windows protocols. Familiarity with basic Windows user skills is assumed in the design of the program, the preparation of program documentation, and the design of the help system.

Several specialized custom tools are featured in PAVER. These tools are Windows consistent and after a brief introduction, will enhance your use of PAVER. These tools are also being made available to developers of other EMSs. Consequently, the features you learn to use in PAVER will be of use in other EMS systems.

Spreadsheet Forms

The basic form for editing and viewing data in PAVER is a table that operates like a spreadsheet. In some instances, these forms are used only to present data and the values displayed cannot be edited. On other occasions, you are able to edit the data or add new lines to the table.

As with other tools, highlighting the spreadsheet and right clicking invokes a menu of spreadsheet tools. Depending on the context, some of the right button click features may not be available. Inactive features are listed in the menu as light gray, while active features have a darker color. The basic right button click spreadsheet features allow table zoom, table layout customizing, add/edit/delete record, search, import/export, print table, and graph options.

Customize NSort, BSort, SSort Headings

Customize NSort, BSort, SSort Headings

Spreadsheet form

Table Name	Field Name	User Name	User Width
Branch	BSORT1	Branch User Sort 1	0
Branch	BSORT2	Branch User Sort 2	0
Branch	BSORT3	Branch User Sort 3	0
NETWORK	NSORT1	Network User Sort 1	15
NETWORK	NSORT2	Network User Sort 2	15
NETWORK	NSORT3	Network User Sort 3	15
SECTION	SSORT1	Section User Sort 1	30
SECTION	SSORT2	Section User Sort 2	30
SECTION	SSORT3	Section User Sort 3	30

Close

Index Cards

Index-style data entry windows are used in several forms by PAVER: **Inventory, Prediction Modeling, Condition Analysis, M&R Planning,** and **EMS Query**. The index-style windows place data entry fields on multiple forms that look and operate like paper index cards. Therefore, if the PAVER form you are using has an index card style interface, you may switch between multiple cards without opening or closing additional windows.

When a window containing index-style data cards first opens, one of the form's index cards is the initial active card. Each index card form includes a tab with a descriptive title. When the index card is active, the contents of the card are visible and can be edited. Only the tab portion of non-selected index cards is visible. Typically, the selected index card and its table is highlighted with a brighter background color. The non-selected index card tabs are darker. Colors vary depending on the Windows color scheme you have selected.

To change the active index card, use the mouse to point to an inactive index card title and left click. The selected card becomes the active card and the previously active card becomes inactive. You can now edit or add entries to the fields on the active index card. After editing is complete, click the close button on the form or use the Windows close form menu. Your data is saved to the database in real time as you make your edits. This means there is no action required to save your changes.

Note

Changes made on the index data cards are made real-time. PAVER automatically saves any changes the user makes.

Click on tab for access to card

Edit fields on active card

Tab Tables

PAVER Tab (tabular) Tables are spreadsheet-like tables used in PAVER to display and edit system configuration information. The **Tab Tables** are accessed from the **Tables** menu option. **Tab Tables** look and operate like spreadsheets. Right button click features are used to print, zoom and configure the tables. Buttons on the bottom of the tab form are used to add and delete records.

There are two types of **Tab Tables**, basic (**Independent**) and linked (**Dependent**). The basic table operates like a standard spreadsheet except that data input into the table is controlled by the series of buttons (**Close, Add and Delete**) that are arrayed along the bottom of the **Tab Table** forms. Clicking the **Add** button inserts a new record into the table, which can then be edited. The **Delete** button is used to remove the highlighted record in the table. The mouse or arrow keys are used to move up and down the rows and across columns in the active **Tab Table**. The active record in the table can be edited. The **Close** button is used to close the **Tab Table**.

The second type of **Tab Table** is a linked table. The linked table uses the records of a basic table or tables as the basis for its data entry. The linked table is referred to as the child, or dependent table, and the basic table is the parent (**Independent**) table. For example, the work type cost table uses three work type tables: localized, global and major as the basis for its entries. Therefore, when you add a record to the work type cost table (a linked table), you click the **Add** button and get a pick list of possible values to add. The table is formed from the entries in the linked table's parent table(s) (localized, global, and major M&R tables in this case).

Linked tables help PAVER enforce consistency in its data tables. For example, if the work type cost table was not linked to the M&R tables it, would be possible to develop costs for M&R procedures that were not even defined. This type of inconsistency, if it occurred, can damage the accuracy of analysis routines like the **Work Plan**.

Printing Screen Images

Printing in PAVER is accomplished in one of three ways. First, the standard PAVER reports include specialized forms for printing reports (see the **Standard Reports** section). The PAVER right button click on tables or graphs tool provides a method of printing tables or graphs. In certain situations, you may wish to print the contents of a screen as it appears, which can include multiple tables, graphs or other data entry forms. To print the image on your screen, select **File** from the PAVER Menu and then **Print** from the **File** sub-menu. In some instances you will note that the **Print** option is not available to select from the **File** sub-menu. This means that there is currently no printable object on the PAVER Desktop.

After selecting **Print**, the print dialog box appears on your screen. The form contains a drop list labeled **Print What**. Open the drop list and select **Form Image**. Click the **OK** button to send a print of the active PAVER window to the printer. You may use the **Printer Setup** dialog window to select an alternate printer if you have access to multiple printers. After you have printed the form image, the print dialog window closes and you return to the PAVER window that was active when you selected the **Print** option.

Graphs in PAVER can be printed in either black and white or color. The default setting in PAVER is black and white printing for graphs. To choose color printing, right button click on the graph and select **Toolbar**. On the toolbar click the **System** button. Under **Printing**, change the selection from **Mono** to **Color** and click OK.

Units of Measurement

To change units from English to metric, go to the **Preferences** selection on the PAVER Menu located above the **PAVER Button Bar**. Click once on **Preferences** and then select **Metric Units** from the **Preferences** sub-menu. Rounding error is not introduced into stored data values if repeated changes between English and metric units occur, because all measurement values in PAVER are stored as metric values. Changing the setting in **Preferences** changes the filters that are used for presenting data on PAVER screens and reports. To ensure that the display properly reflects the unit change, it is best to close all data entry and report screens before switching preferences.

Adjusting Table and Graph Sizes

Tables and graphs automatically re-size to the available space on your computer display. As the number of active tables increases, the number of lines allocated to each table reduces. If a table is associated with a graph, the table and the graph share the horizontal space that is allocated to the table. You can adjust the space allocated between a table and its associated graph by pointing to the vertical bar that separates a table from its graph and then, while pressing the left mouse button, drag the separator bar to the right or left. You cannot manually increase or reduce the vertical space allocated to a table in the **Report Viewer**. If you want to increase the vertical space available for a table you must close one of the other **Report Viewer** tables. You may use the zoom function on active tables with the right button click tool for a temporary larger presentation of a table or a graph.

EMS Tools in PAVER

Right Button Click on Tables

Whenever possible, information in PAVER is presented in tables. These tables are used to input, edit, and review reports (**EMS Report Viewer** and **Reports**). The tables in PAVER are equipped with several features that enhance the capabilities of the PAVER system. These features include:

- Table printing

- Exporting the table to Excel

- Changing the formatting of the table

- Zooming on the table

- Adding or removing fields

- Sorting the table

To access the extended table features you must first make the spreadsheet table active, by clicking on the table. Once the table is active and the mouse pointer is over any portion of the table, right click to invoke the menu of extended table features. Select items from the right button click menu by pointing to the menu item and left clicking.

In addition to the right button click table features, column widths can be reduced or enlarged when a table is active. To change column width, point to the vertical line positioned between the columns. When the mouse pointing indicator changes from the large arrow to the small double arrow icon, click and drag the column border to the desired size.

Right Button
Click menu
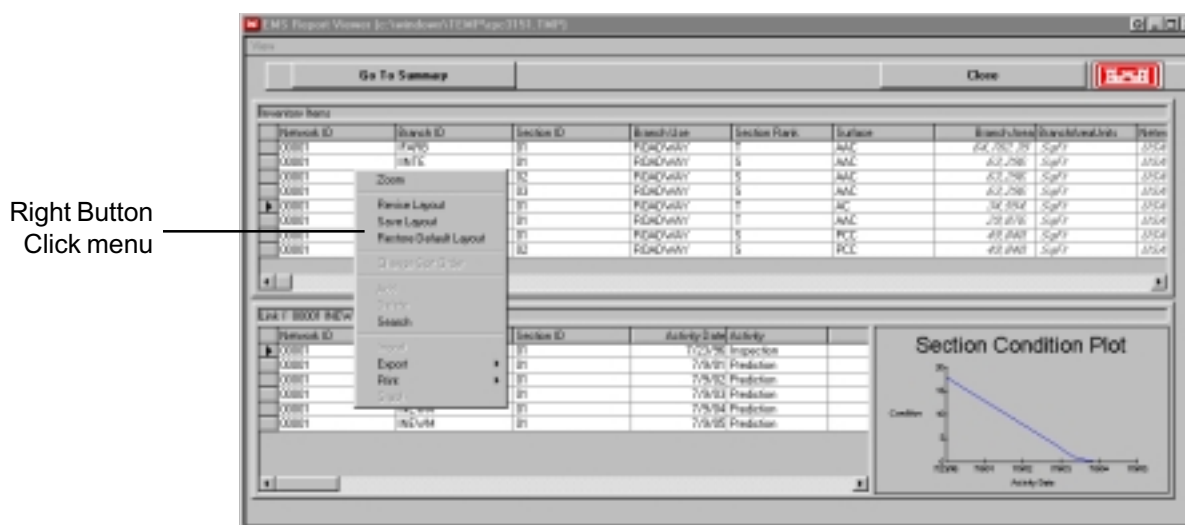
Right Button Click on Graphs

PAVER graphs can be printed, customized and zoomed in the same manner as PAVER tables. To view a PAVER graph, make the graph active by clicking on the graph. While the graph is active and the mouse pointer is anywhere on the graph right click to invoke the graph menu. Select items from the graph feature menu which is accessible with a right button click.

You can customize the look of PAVER graphs on the fly by using the EMS right button click tools. The graph **Zoom** feature enlarges the graph to the full extent of the window in which the graph is located. From the zoomed graph window, you can copy the graph to the clipboard to later paste into spreadsheets, presentation programs or other Windows applications. To return to the original window, right click on the zoomed graph and select **Unzoom**.

Toolbar invokes a graph editor (**Graph Control**) that allows you to customize graph type and presentation. For example, you may change the graph type from a two dimensional bar graph to a three-dimensional pie chart. The **Save Layout** feature saves the current graph configuration so that on subsequent visits to the current graph it will retain the graph properties you specify using the **Toolbar**. The final graph feature, **Print**, allows you to print your graph to a Windows printer.

Right Button Click menu
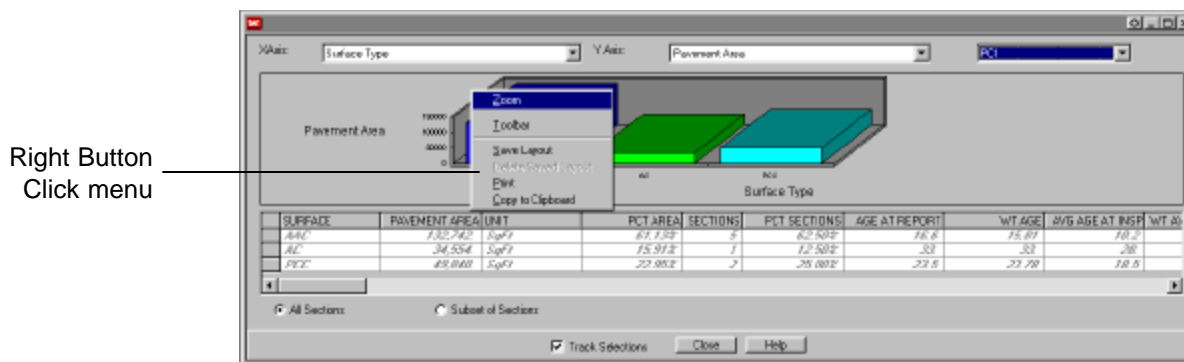
EMS Query Tool

The **EMS Query Tool** is used in several places in PAVER to select a subset of pavement sections to use in reports and data modeling. The query tool can also be used to specify the sorting order of data. Selection and sorting criteria specifications can be stored and retrieved by name in the **Stored Criteria** box. The query tool also reports the record count (number of sections selected), as filtering queries are built.

Using the EMS Query Tool

Filter criteria are entered using the drop boxes arrayed across the query form. Fields are entered from left to right and top to bottom. As you enter query information, only the next field will be highlighted for user selection. For example, use the first entry in the **Field** column to select Surface. Once you have selected **Surface**, the **Comparison** field is highlighted. After selecting a query field and the comparison evaluator (=, >, <, >=, <=, <>), the **Compare To** field becomes active. The drop list on the **Compare To** field lists the available choices in the database for the selection you made in the **Field** column.

After you make a selection in the **Compare To** field, the record count indicator will change as the query you are building is applied to the database in real time.

The first column on the query form contains the query statement operators (**And, Or**). These operators are used to join the individual query statements. To see the **Structured Query Language (SQL)** query that you have built with the query tool, click the **View Text** button at the bottom of the screen. The **Clear All** button removes all selection criteria on the screen. Click the **Save** button on the **EMS Query Tool** to save a set of report criteria.

The **AND/OR** operators require some additional clarification. For example, if the user wants to include pavement sections constructed with asphalt and concrete then the correct operator is **OR**. The query will return any sections that fit either of the conditions. However, the **AND** operator only returns sections that fit all of the listed conditions. For example, selecting asphalt surfaces and branch use equal to parking lots with the **AND** operator returns only asphalt parking lots. Using **AND** with the first example will return nothing, since it is impossible for a section to be both asphalt and concrete surfaced.

Store query criteria —

Indicates number of included sections —

Select query criteria —
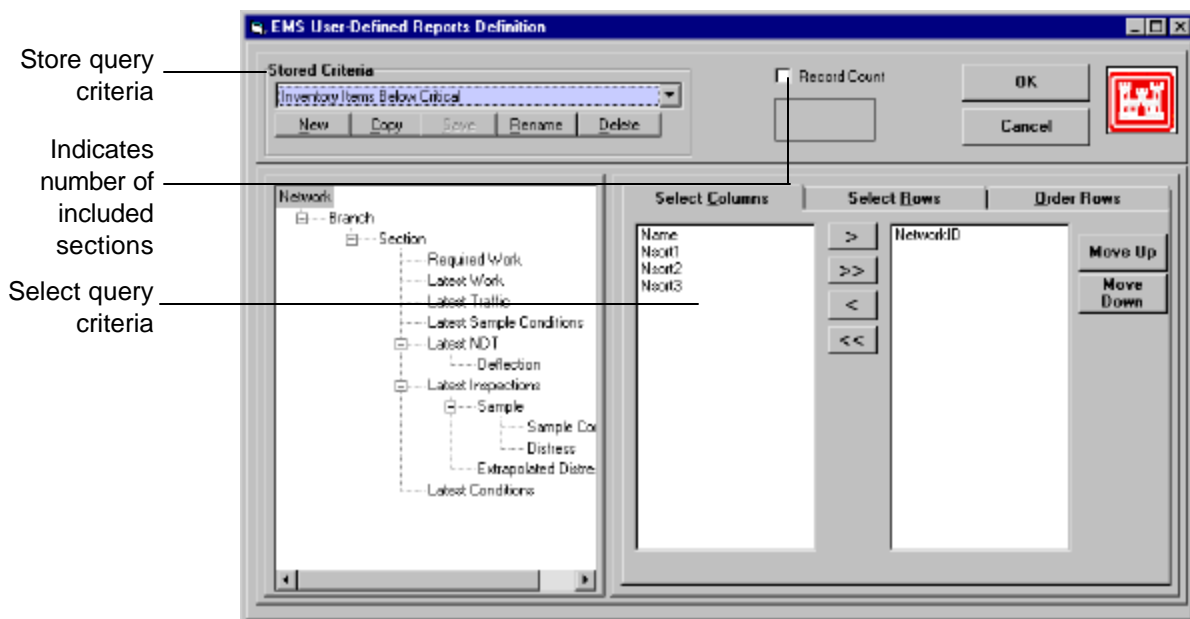
Report Viewer - Summary and Detail Options

The PAVER analysis reports: **Condition Analysis Report**, and the **M&R Report** are presented in the **EMS Report Viewer**. The **EMS Report Viewer** is a tool that provides a framework for displaying multiple spreadsheet-like tables that contain report information. The spreadsheets in the **Report Viewer** can be associated with graphs that operate in conjunction with the spreadsheet tables. The **Report Viewer** organizes the presentation of report results in two basic views, the summary view and the detail view. The summary view includes high level views of summarized report data. The detail version of the report includes section by section details that are covered in the summary version of the reports. To switch from between the Summary and Detail views, click on the **Go to Detail/Summary** button.

View Menu - Display Specific Report Information

The **Report Viewer** includes a **View** option that is used to open and close the various spreadsheet views of the report data. You may use the **View** in the **Report Viewer** window to configure the report viewer so that it presents only the information you wish to view. The default presentation of the **Report Viewer** is the summary version. To turn off one of the summary tables (and its associated graph), select **View** from the **Report Viewer** window, **Summary** from the **View** sub-menu and then select the table which you want to turn off. Tables or graphs which are active in the current report view have a check mark to the left of the table or graph name.

Under the **Detail** sub-menu, **Plan Parameters** opens a table displaying the parameters that were used to configure the current report. This is convenient for checking the settings you requested when you ran the report without having to leave and rerun the report.

View Menu

Select tables and graphs to display

Report Viewer Tables

The spreadsheet tables in the report viewer are standard PAVER tables and support the right button click on tables features. When an **EMS Report Viewer** report (I.E. **Condition Analysis** or **M&R Work Plan**) is displayed the tables are made active with a left click.

Spreadsheets in the **Report Viewer** can be associated with graphs. These graphs are implemented in two different ways. The first type associates a graph directly with a single row, the active or highlighted row, of the table. In this case, as the user changes the active row in the spreadsheet, the graph dynamically adjusts so that the graph reflects the active row in the spreadsheet.

The second type of graph association is as an overlay on an existing graph. For example, in the **Condition Analysis Report**, a table showing combined section condition history and projections is linked to a graph that plots the condition over time. This graph can further be overlaid with a plot of the family curve assigned to the section. As elsewhere in the program, graphs in the **Report Viewer** can be zoomed, printed or configured with the right button click on graphs feature.

Exiting the Report Viewer

When you have completed reviewing a **Report Viewer** report, close the report by closing the **Report Viewer** window. Click on the **Close** button in the top right corner of the **Report Viewer** window. Windows users may also use the mouse to select the close Window symbol (**X**) located in the upper right corner of the window.

After you close a report, you are prompted to save the report. If you choose to save the report, a file dialog box window is presented so that you can name the report to be saved. *Note: Each report type has its own unique file extension: Condition analysis reports are .rpc files and M&R Work Planning reports have .rpw extensions. These extensions should be maintained when you name a report file.*

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Database Tools

Combine/Subset Database

The **Combine/Subset** option enables you to combine multiple databases or portions of them into a single database or to separate a database into different parts based on user preferences. The **Combine** option is also useful for making a copy of a database to protect an original.

The **Combine/Subset** form has four components: source file selection, destination file specification, selection criteria and processing status. Click the **Select** button associated with the large file selection list window labeled **Source** to identify the file(s) to be combined, split, or copied. To combine databases you need to select two or more files. Select only one file if you are subsetting or copying a file. Specify the target for the combined or subset database by clicking the **Select** button associated with the window labeled **Destination**. Enter a new file name for the database that you are creating.

The **Selection Criteria** button invokes the **EMS Query Tool** to filter the source databases. For example, you can combine several databases choosing to select only those sections from the source databases that have surface type equal to AC and rank equal to P (primary). Note that the selection criteria you specify depends on the values in the first source database you select for the combine operation. For example, if the first database you select has no AC pavements, the **EMS Query Tool** can not be set to select AC as the filter for surface type.

Select source database or databases

Select a file name for the new database

Run **Combine/Subset** procedure

The **Execute** button launches the **Combine/Subset** operation. The processing status area of the screen monitors the progress of your operation and posts the results. Once the operation is complete, click **Exit** to close the **Combine/Subset** form and return to the PAVER desktop. Use the **File/Open** option from the PAVER Menu to select the newly combined, subset, or copied database.

Import / Export

The **Import/Export** utilities are used to exchange data between different computers running PAVER version 5.0. The database sender uses PAVER **5.0 Export** to create a single file with the extension "e50" - to signify "export, version 5.0" that can be brought into another PAVER system using PAVER **5.0 Import**. The receiver uses PAVER **5.0 Import** to transform a single file (with the extension "e50") prepared with the PAVER **5.0 Export** program, to a working pavement database in their PAVER system. This e50 file is a compilation of three separate files required to open a PAVER database. Once in the system of the receiver, the database can be opened.

5.0 Export Procedure

The **5.0 Export** window is divided into three sections: **Options**, **File Selection**, and **Working Status**. Export files can contain different combinations of pavement data and common data. Pavement data is accessed from the **Inventory**, **Field Inspection** and **Field Data** areas of the PAVER program. Common data is accessed from the **Tables** menu. The contents of the Export file are determined by the selection of one of three options that are located at the top of the Export form. A description of each **Export Option** follows.

• **Export pavement database and associated family** - This creates an exported file that contains all the pavement data for the selected database and the family modeling information for any families assigned to the pavement sections within the selected database.

• **Export pavement data and all family** - This extends the first option by adding all family models to the export file, even if they are not currently assigned to any of the exported sections. You must designate a database to export.

• **Export system tables** - This option includes all the common PAVER data contained in the Tables menu. No pavement data is exported if only option three is selected.

Configure the **5.0 Export** file by selecting the check box next to the appropriate option. As you configure your export file, consider that the system importing the file that you are creating imports all the information in the export file unless the importing user takes special steps not to overwrite existing files. If you specify that an export file includes all system files, the person importing your file will replace their system files with the system files that you have exported.

If you have selected the first or second options, you must specify the pavement database to export. You may do this by clicking the **Browse** button in the **File Selection** area for Pavement file to export. The export file that is created will be located as indicated by the **Export path and file name selection**.

When these steps are complete, click the **Export** button located on the lower left portion of the export window. The **Working Status** portion of the export window displays the progress of the export process and indicates the completion of the export file. You may reconfigure the export options to create another export file or click the **Exit** button to leave **5.0 Export**.

Configure export options

Select database to export

Begin export procedure
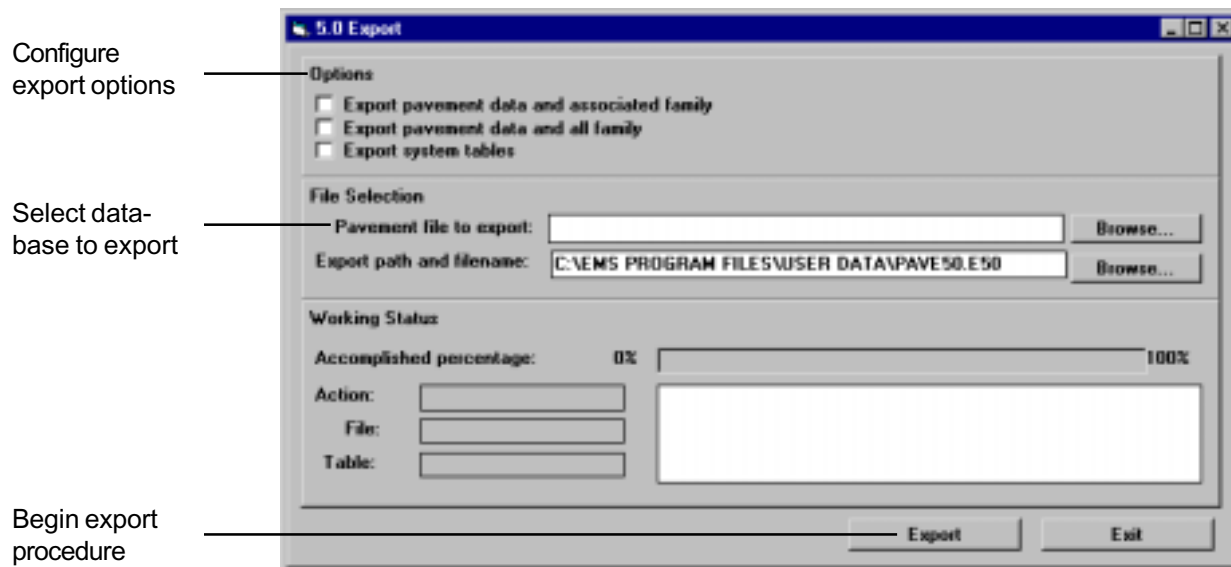
5.0 Import Procedure

The **5.0 Import** screen is divided into three sections, **File Selection**, **Options** and **Working Status**. In **File Selection**, click the **Browse** button for **Import file name** to specify the file to be imported. These include files with the formats e50 as well as e40. Select the type of file, e50 or e40, that you would like to import. Select the file. A second **Browse** button is associated with the **Import path**. The **Import path** refers to the location and name you wish to assign to the pavement data that is to be imported. When you identify an e50 file for a database under the **Import file name** selection, the default name for the database is placed in the **Import path box**. Clicking the **Browse** button associated with the **Import path** opens the **Open/Create Pavement Subdirectory** form. You can edit this form to change the default selection. The form shows the default path to your pavement databases and provides a pick list of your existing pavement databases. You can select an existing database (in which case the data you are importing overwrites the existing database) or type in a new name, and the import file is be copied to this new name.

The **Options** portion of the **5.0 Import** window shows the data included in the import file. These items are not user adjustable. If the first check box, **Import pavement database and associated family**, is checked, the import file includes only pavement data and the families that are assigned to those pavements. Unless you already have a pavement database with the same name as the imported database, none of your current data will be overwritten when you import this data.

Unlike the first option, **Import pavement data and all family** and **Import system tables** overwrites a portion or all of your PAVER system tables. The PAVER system tables are the data contained in the various data tables that are used to configure your work plan report, data entry pick lists, units and family models. Unless you wish to replace your current system tables with the system tables from another PAVER system, do not import them.

Clicking on the **Import** button launches the import routine. If the import routine does not cause any existing data to be overwritten, the import procedure will proceed uninterrupted. If the import routine is configured such that it will overwrite existing data (either pavement data or system data) a Windows message box appears and presents you with three options: Abort to skip this file, Retry to overwrite the current file, and Ignore to overwrite all files. Select the appropriate choice.

When the import procedure is completed the PAVER status window shows a "Done" message. Click the **Exit** button to leave the **5.0 Import** Window. The data you imported can be opened by choosing **File**... **Open** from the PAVER Menu. Select the imported database from the list of available PAVER databases.

Select e40/e50 file to import	
Configure import options	
Begin import process	

5.0 Import

File Selection
Import filename: _____ Browse...
Import path: c:\ems program files\paver\..\ _____ Browse...

Options
☐ Import pavement data and associated family
☐ Import pavement data and all family
☐ Import system tables

Working Status
Accomplished percentage: 0% [_____] 100%
Action: [_____]
File: [_____]
Table: [_____]

[Import]   [Exit]
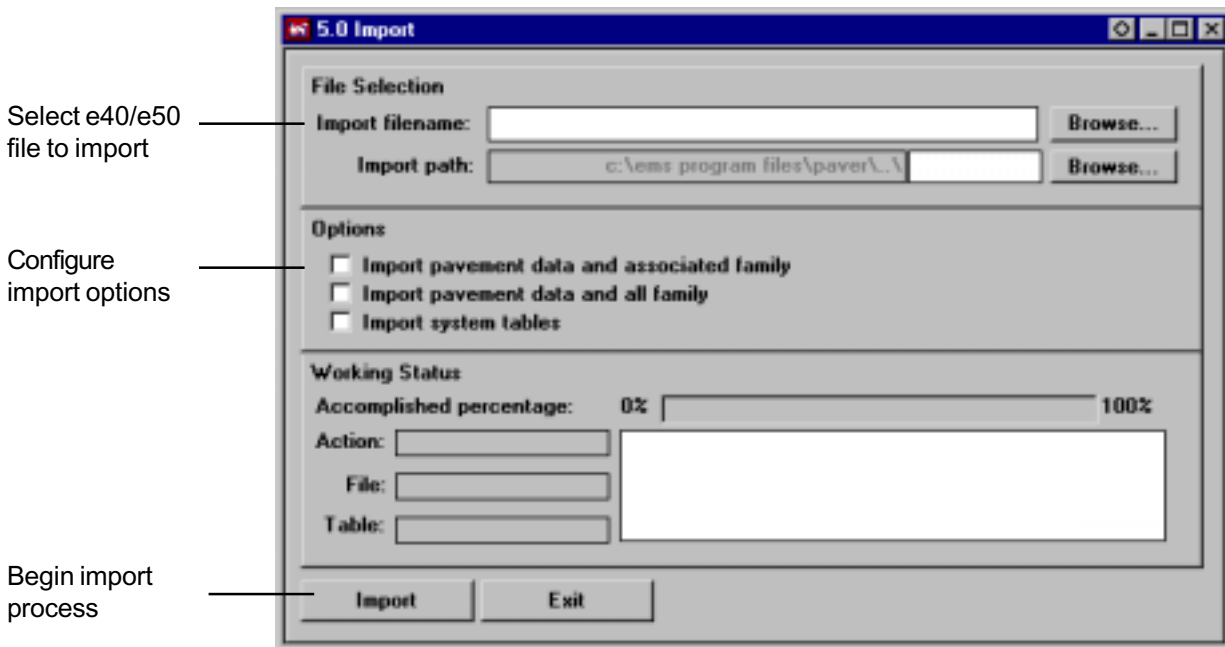
Database Verification Tools

This utility is used to perform a check of database components to see if there are any identifiable problems. This is not intended to be a comprehensive troubleshooting tool, but it is a good place to start when you encounter errors with PAVER. Each checkbox represents a separate segment of the verification process. A brief description of each follows:

• **Remove Duplicate Family to Section Assignments** - Only one family model is assigned to a section. If two or more are assigned, it follows the instructions given in the "Family Assignment" selection box to the right. You can specify that PAVER use the last non-default family or restore the default model.

• **Verify Section Construction History** - The LCD (Last Construction Date) must agree with data in the Work History table.

• **Verify / Reset Latest Inspection Indicators** - The last inspection date and corresponding PCI must be properly displayed with the section inventory information (checks data against inspection data).

• **Verify Distresses and Recalculate Conditions for all Sections** - This ensures that there are no unidentifiable distresses or zero quantity distress information and recalculates the PCI (last inspection date).

• **Verify Duplicate Major M&R** - No two records should have Major M&R activity listed for the same date in the Work History tab

• **Verify Work (Required/History) Descriptions** - All data in fields where input is restricted to drop lists must be valid data.

When the verification is complete, the utility produces a list of exceptions and corresponding sections. You can print the table, sort it, or export it to Microsoft Excel. To export, click with the right mouse button on the table to access these options. The **Print** button at the bottom of the window prints the table directly.

A table of **Exceptions** is created
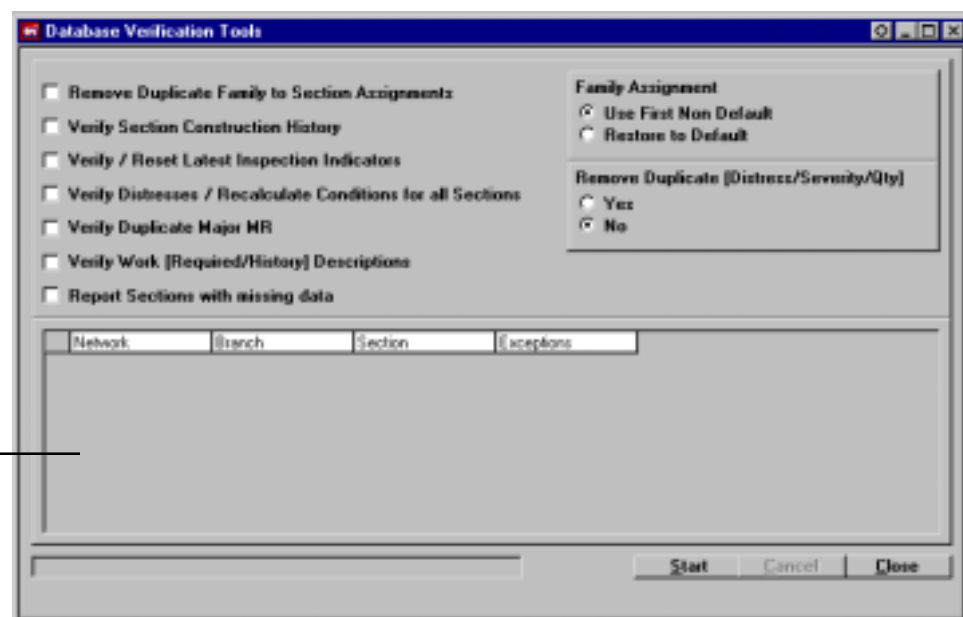
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Selectors

Navigating the Pavement Inventory

PAVER 5.0 provides several options for choosing the portion of inventory with which the user wants to work. These "selectors" make moving from one part of the inventory to another quick and easy. The selectors are accessed directly from the **Selection** button on the main toolbar or by going into the **Visual Menu** and choosing **Selectors**. Other parts of the program that require the user to specify a component of the inventory (i.e. Network, Branch, Section) respond to the input received from the selector tools. There are three selectors: **Tree**, **Tab**, and **GIS**. A combination of two, referred to as **Tree and GIS**, can also be used.

The Tree Selector

> **Note**
>
> For databases with more than 500 Branches, the **Tree selector** may experience very long load times. It is recommended that you either split the database or use a different selector.

Since the inventory in PAVER is represented in a hierarchy similar to the file structure in Windows, it is logical to navigate this structure in a tree format. Much like the Explorer tool in Windows, the Tree selector allows you to move through the hierarchy of your database and select the specific Network, Branch or Section from which information is needed. This is done by moving down the "tree" until you arrive at the desired location.

Navigate through tree structure
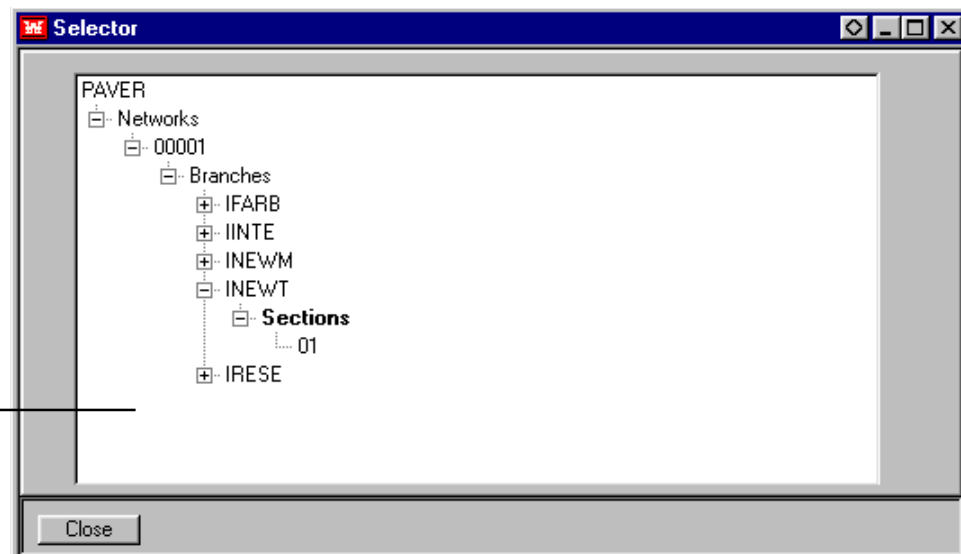
The Tab Selector

For those who like the PAVER 4.2 method of selecting inventory items by selecting from the **Network**, **Branch** and **Section** file cards, the **Tab Selector** has a similar look and feel. Starting with the **Network** tab and working across to the **Branch** and **Section** tabs, the user can select and view data at any level of the inventory. Along with selection capability, all data contained at each level can be viewed directly from the same window the selection is made. Unique **ID** numbers and user defined sort field data are also now available for viewing with this selector.

Navigate inventory with tabbed index cards to find selection
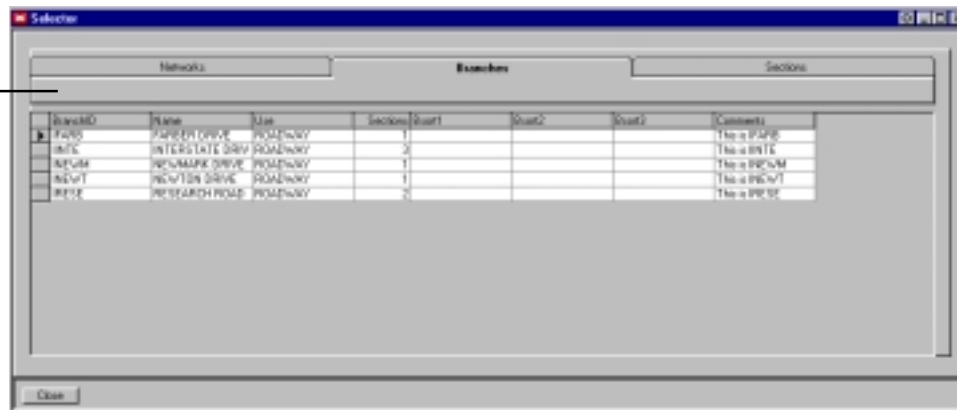
The GIS Selector

Because GIS has become more integrated into Micro PAVER, the user can now select an inventory item by using a GIS coverage. This first requires the database to be linked to a coverage via the PAVER GIS process. Once the GIS link has been completed, the map can be viewed via the **GIS Selector**. By simply pointing and clicking on any polygon (or arc) in the coverage, the selector makes the link to that section. Like the **Tree Selector**, the **GIS Selector** only allows selection. No data is displayed.

Locate an
inventory item
by selecting it
via GIS
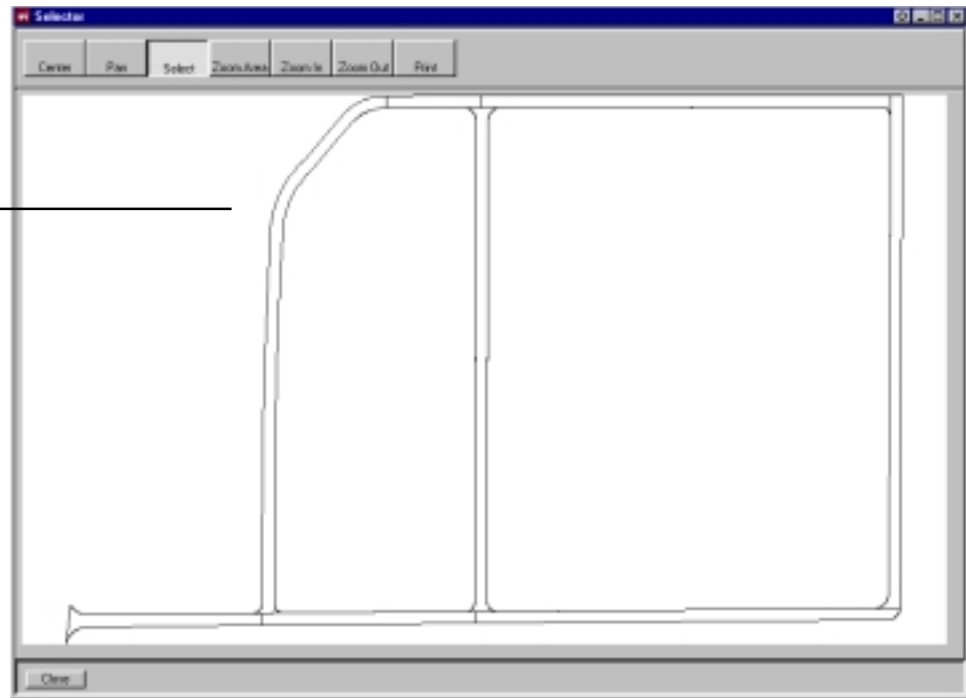
The Tree and GIS Selector

The last choice from the **Selectors** menu is the **Tree and GIS Selector**. This is simply a combination of the **Tree and GIS Selectors** both displayed in one window. This allows you to select an inventory item using the easiest method for the particular inventory item. For example, if you know only the location of the pavement, the **GIS Selector** is most useful. If you need to trace through the hierarchy, the **Tree Selector** is the logical choice. The **Tree and GIS Selector** combines both of these features into one compact tool.

Selecting an
inventory item
with the tree is
aided by GIS
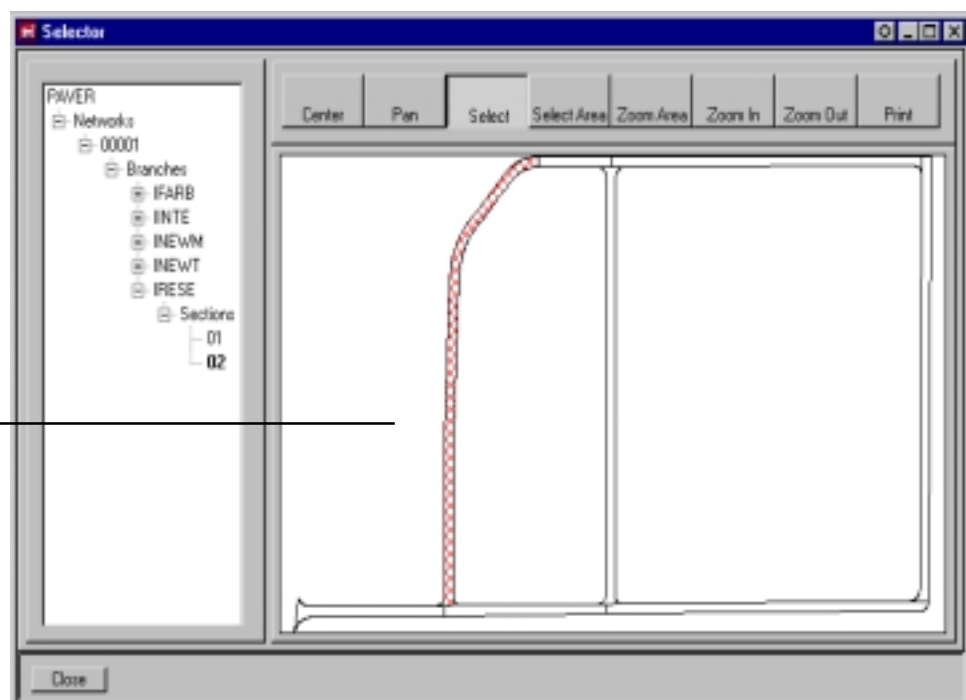
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System Tables

Define User Fields

The PAVER system is designed so that you may assign user defined fields to each level of the inventory (network, branch, and section.) The advantage of this capability is that PAVER allows you to sort the database at any level according to criteria that you have defined. This is helpful if you want to select certain networks, branches, or sections for reports or work plans. There are two types of user defined fields. **SORT** fields are designed to be pick list fields, requiring you to select among a predefined set of choices. **Additional User Fields** require the user to enter data.

NSORT - BSORT - SSORT

At each level of the Inventory hierarchy (network, branch, and section), PAVER allows you to create three **SORT**s. Under the main menu, select **Tables**...**Define User Fields**...**SORT** for the desired level of inventory. Enter data by clicking on the field you wish to edit. The entries for **Name** should be short and easily recognizable since these will be displayed in PAVER as the options presented in the picklist for the **SORT** field. The **Description** entry should indicate the complete name. Click **Add** to add more entries for the sort, and click **Delete** to delete the selected entry. The selected entry is indicated by an arrow in the left margin. To assign criteria for the other two **SORT**s, click on their corresponding tabs.

Sample entries for SSORT by intersection type
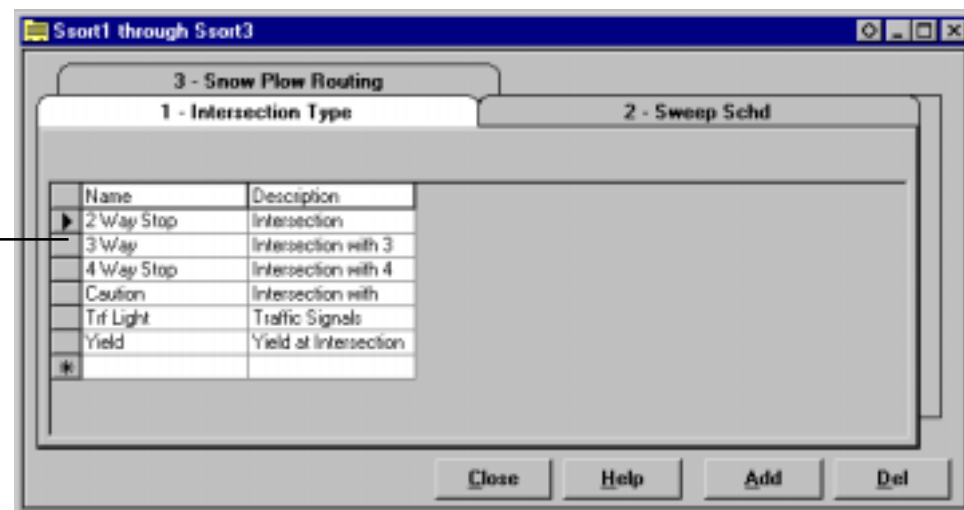
Additional User Fields

This section allows you to create user-defined fields in which you may enter data. From the PAVER main menu, select **Tables**...**Define User Fields**...**Additional User Fields**. To create a new field, first select the desired inventory level and click on **New**. A second window appears. You need to supply the following information:

• **Field Name** - The entry for this is displayed as the **Additional User Field** name when using this capability in PAVER.

• **Type** - Designate what kind of data is to be put into the field: Yes/No, Currency, Date, Integer, Text, etc. When you use the **Additional User Field** in PAVER, you are only able to enter data of the **Type** you specify.

To edit the **Type** of an already existing entry, select it from the list of **User Fields** and click on **Edit**. To copy the field, click on **Copy** and assign a new name for the field. **Delete** deletes the selected field, and **Rename** allows you edit the **Field Name**.

Name of user defined field

Select Inventory level

Type of data to be input in field
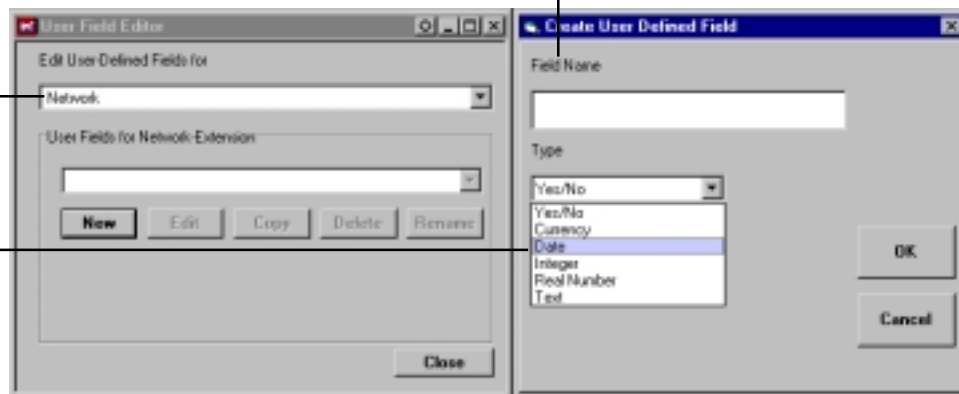
Customize NSort, BSort, SSort Headings

This window allows you to set the values for the **User Name** (the name displayed in PAVER) and the **User Width** (the size of the field) for selected preset fields in PAVER. The first two fields, **Table Name** and **Field Name**, are displayed in italics and cannot be edited.

Table Name and Field Name cannot be edited
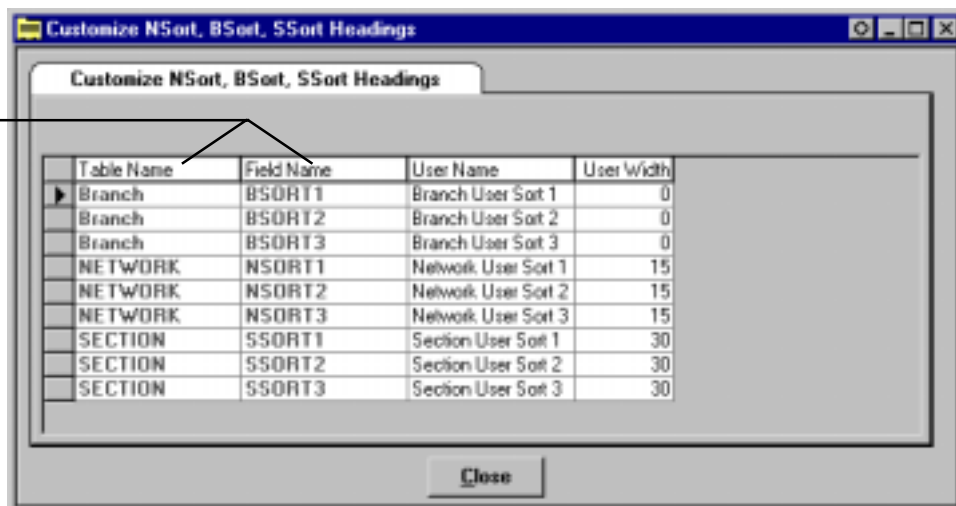
Table Name	Field Name	User Name	User Width
Branch	BSORT1	Branch User Sort 1	0
Branch	BSORT2	Branch User Sort 2	0
Branch	BSORT3	Branch User Sort 3	0
NETWORK	NSORT1	Network User Sort 1	15
NETWORK	NSORT2	Network User Sort 2	15
NETWORK	NSORT3	Network User Sort 3	15
SECTION	SSORT1	Section User Sort 1	30
SECTION	SSORT2	Section User Sort 2	30
SECTION	SSORT3	Section User Sort 3	30

Inventory Pick Lists

This window displays seven tabs that provide editing access to a group of "pick lists" within PAVER. All of these tabs allow you to add items to the current list. In some cases, existing table data is considered to be default and cannot be deleted. In most areas, PAVER will direct the process of data input to conform to the necessary PAVER database formatting. Some fields allow you to enter any text value, while other fields produce a prompt to the user to select an option from a list that is displayed. Examples of using this window are:

• Customizing **Zone** names

• Naming a new **Surface Type**

• Adjusting M&R Priorities for different Rankings.

To edit a pick list, click on a tab

Edit entries for **Section Ranks** pick list here
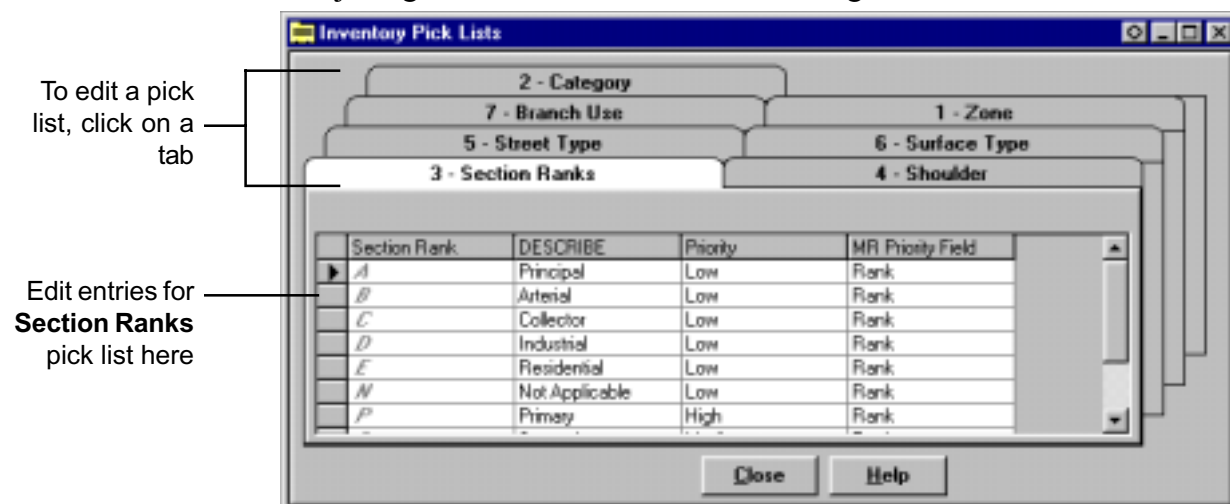
Clicking **Add** adds a new record to the table. Before clicking **Delete**, first highlight the desired record by clicking on the box at the left of the record. PAVER asks you to confirm every Delete action.

M&R Plan Tables

All tables found under this category are tables that PAVER uses when executing the M&R plan. Like previous tables, most of these tables allow you to add items and delete non-default items. To edit a cell in the table, click on the cell you wish to edit and enter the new value. Once changes are made, they are automatically saved to the system. A brief description of each table follows.

Localized M&R

• **Work Types**: A listing of all work types classified as localized repairs.

• **Distress Maintenance Policies**: You can define separate tables and group different localized work types for different maintenance scenarios.

• **Work Type Cost Tables**: You can create different cost tables to correspond with different jobs or regions. There must be a cost entered for all work types listed.

• **Consequence of Maintenance Policy**: For every work type listed in the localized category, there is an associated table here. Each table consists of a list of all distresses related to this work type and the resulting distress produced as a result of performing this type of work. This assists the **Work Plan** in predicting future PCI's.

Cost scenarios for **Localized** work

All **Localized Work Types** are listed here

Localized M&R

| 3 - Work Type Cost Tables | 4 - Consequence of Maintenance Policy |
| 1 - Work Types | 2 - Distress Maintenance Policies |

Code	Name	Work Unit
CS-AC	Crack Sealing - AC	Ft
CS-PC	Crack Sealing - PCC	Ft
GR-PP	Grinding (Localized)	Ft
JS-LC	Joint Seal (Localized)	Ft
JS-SI	Joint Seal - Silicon	Ft
NONE	No Localized M & R	SqFt
PA-AD	Patching - AC Deep	SqFt
PA-AL	Patching - AC Leveling	SqFt
PA-AS	Patching - AC Shallow	SqFt

Close   **Add**   **Del**

Global M&R

• **Work Types**: This is a listing of all work types considered Global. This includes M&R work applied over a larger area of pavement. Other data included in this table is the **Application Interval** that work would be reapplied and the **Delta Age**, or change in age, of the pavement. This "Delta" is defined as the time (in years) it would take for the condition of the pavement to return to where it was prior to application of the global treatment. Again, the M&R Plan uses these numbers when predicting condition.

• **Cost**: This is similar to **Localized**. The user can create different cost tables depending on the scenario.

Major M&R

• **Work Types**: All work types considered to be major are listed here.

• **Work Type Cost Tables**: All costs associated with **Major M&R** work types are listed here.

• **Branch Use Priority**: The user has the ability to assign a priority to pavements based on their declared usage. This priority is considered during M&R Plan execution and determines how limited funds are spent.

• **Section Rank Priority**: The user may assign a priority to pavements based on section rank.

• **Priority Table**: This is a priority matrix based on Branch Use Priority and Section Ranking. The lower the number, the higher the priority.

• **Minimum Condition**: This table allows the user to set the **Minimum Condition** or critical PCI. A critical PCI (or **Minimum Condition**) is set for the combination of each **Branch Use**, **Section Rank**, and **Year** combination.

Select priority for **Major M&R** for each **Branch Use**

M&R Cost by Condition

This window allows the user to create cost tables for different scenarios. Costs are grouped into four categories:

• **Local**: These costs refer to localized repair work triggered in the M&R Plan in the "Policy > Critical" section.

• **Stop Gap M&R**: These are localized repair costs triggered in the "Policy < Critical"

• **M&R Airfields**: This is a cost list of major M&R work done on all pavements that fall into the "Airfields" category.

• **M&R Roadways**: These are costs associated with major work done on all pavements classified as "non-airfield", such as roads, parking lots, etc.

For the above cost tables, the costs are for doing work "by condition". Enter an estimate on the pavements based on a range of conditions from 0 to 100 by increments of 10. The unit cost to perform work are generally less for a pavement with a better condition. However, you can create tables and customize them in a way that reflects the actual cost of doing work. The **M&R Plan** uses these figures to calculate budgets for all years beyond the first. Click on **New Table** and enter a name for your cost by condition scenario. Click on any cell you wish to edit and type in the new value.

M&R Cost By Condition

Name: Default Cost by PCI Range

Cost Category	Units	0	10	20
Local	SqFt	$0.75	$0.56	$0.39
M&R Airfields	SqFt	$3.33	$3.33	$3.33
M&R Roadways	SqFt	$2.50	$2.50	$2.50
Stop Gap M&R	SqFt	$0.15	$0.10	$0.07

Cost per square foot for major M&R done on roadways with PCI of 0 to 9

New Table   Rename   Del Table   Close   Help

Budgets

Here, you can create tables to specify a budget for each year. When running the **Work Plan**, you can select from a list of budgets. To create your own budget, click on **New Table**. You are given the option of copying the budget that is displayed. When creating a new table, select the copy option to save time entering data if most values are the same. Enter **Year** and budget **Amount** information. By placing actual budget numbers in a budget table, you can restrict the spending of the work plan to a specific budget. Creating different budget tables also allows you to compare the results of different **Work Plan** scenarios.

Budgets

Funds By Year

Name: 100K per Year

Year	Amount
1/1/1996	$100,000.00
1/1/1997	$100,000.00
1/1/1998	$100,000.00
1/1/1999	$100,000.00
1/1/2000	$100,000.00
1/1/2001	$100,000.00
1/1/2002	$100,000.00
1/1/2003	$100,000.00
1/1/2004	$100,000.00
1/1/2005	$100,000.00

All budgets in your system are listed here

Enter a budget amount for each year

New Table   Rename   Del Table   Close   Help   Add   Del

Condition Tools

Select Condition Types

To make condition types available for use in PAVER, they must be declared in this window. Condition types will be classified as **Numeric** or **Textual**. You may declare **Minimum** and **Maximum Values** for **Numeric Condition Types**. To make a condition available for use in PAVER choose "yes" in the **Selected** column. If you would like to keep the condition data in the table for future use but do not wish to make it accessible, a "no" in the **Selected** field hides the condition from the program.

Define Condition and Age Categories

The user may establish a set of categories for each condition available in PAVER. The table for each set of condition categories consists of a name for the category (i.e. "Good", "Poor", etc), a high and low value to establish the range for the category, and associated colors for each category to be used in the graph and GIS text. The **Age Categories** tab is simply a table of age brackets by which you can group pavements. These tables are used in the graphical display of condition information throughout PAVER.

Define User Distress Indices

New

You may now create your own condition index based on your selection of distresses.

You have the option to create a user defined index. These indices are computed with the same engine that PAVER uses to calculate the PCI, so the index is a customized PCI. After naming the index, select every distress and severity level that is to be included in the computation. At this point, PAVER then uses deduct values from only the specific distresses indicated. Other distresses are ignored for this index. After naming the index and selecting the applicable distresses, this distress appears on the **Numeric Condition Types** tab of the **Condition Type Selection** table. The only way to delete the newly created index is to return to the **User Defined Distress Indices** table.

Misc. Other Tables

There are four tables here that allow you to enter specific information into PAVER:

Aircraft Type

This table holds information on a variety of aircraft and will be used in later versions of PAVER to catalog airfield traffic and its effect on pavement condition.

Materials

This table is a list of all material types, with **Item** number and **Description**, that are available for selection within PAVER. These are used in the **Work** section of PAVER, where you can list the specifics of work that has been performed, including the type of material used. You can add any material types to this list by entering an **Item** and **Description**.

Layer Construct

This table contains information on different work types associated with base preparation. In order to enter a line item of work specifically for base course, establish the work type in the **Layer Construct** table. The information on these lists is accessible from **Work**, under the **History** tab.

Unit of Measure (Field) Settings

Here, select a particular unit from a pick list to be associated with measurements used within PAVER.

Inventory

Definition

Managing Pavement Inventory - Basic Operations

The **Inventory** button provides tools to view, edit, and define pavement networks. Clicking on the **Inventory** button opens two windows.

The **Select Inventory Item** window is a series of drop-down boxes that allow you to navigate to a specific point in the inventory. Select the particular inventory item by working down the hierarchy of the database, from network to branch, then to section. At each level, you can select an item via **ID** or **Name**.

The larger window is the inventory data window. In this window, you can edit inventory data. To access data for a particular level, click the tab for **Network**, **Branch** or **Section**. In order to change the displayed inventory item, locate the item in the **Select Inventory Item** window. The inventory data window updates itself accordingly.

Inventory Item Selector

Inventory data corresponds with **Select Inventory Item** window

These buttons appear on **Network**, **Branch**, and **Section** cards

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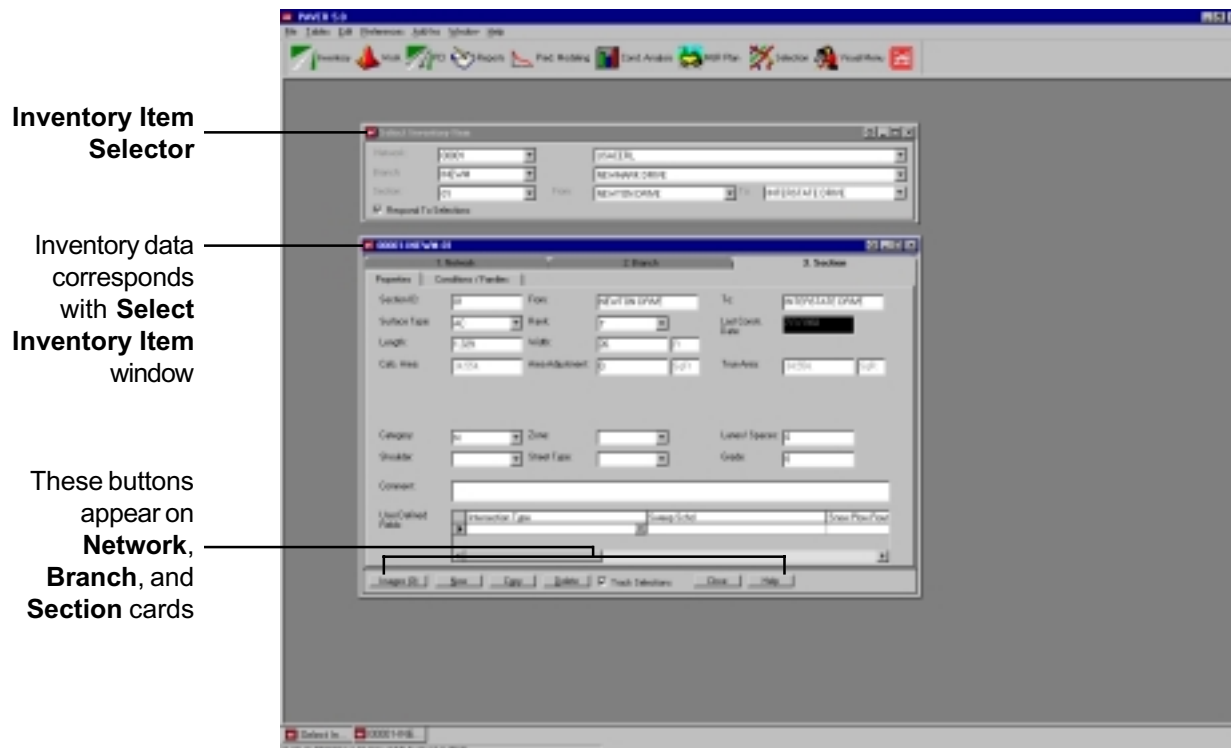
At the bottom of the inventory data card, there is a check box for **Track Selection**. If this box is not checked, the inventory data card will not change when a new inventory item is chosen in the **Select Inventory Item** window.

You may move to different fields on the inventory data form by clicking on the field you wish to edit in order to enter information. You may also move from field to field on the form by pressing the tab key. Each press of the tab key shifts the selected filed once to the right. Once the end of a row has been reached, a press of the tab key shifts the selected field down one row to the furthest left field.

Data fields in PAVER 5.0 only accept entries of a determined type of characters. For example, a distance field can contain only numeric information. If you try to enter non-numeric characters into a distance field, the program will not accept your entry.

Each of the inventory cards (**Network**, **Branch**, and **Section**) have six buttons along the bottom of the form. The **New** button is for adding new inventory items. The **Copy** button is used to create a new network, branch, or section identical to the selected network, branch, or section except that the **Network**, **Branch** or **Section ID** will include the characters "CC" to indicate that it is a copy. None of the copied network's children (branches and sections) are copied when a network is copied. Likewise, when a branch is copied, none of its sections are copied.

Clicking the **Delete** button deletes the selected network. The **Help** button starts the PAVER help system. **Pictures** launches the **EMS Image Viewer**. For more instructions on the use of this, please see **EMS Image Viewer**. The **Close** button closes the Inventory program.

You may also assign values for the user defined fields. This can be done only when the parameters for the user defined fields have been established (See **System Tables-Define User Fields**). Once this is done, the inventory can be sorted based on user defined criteria for many applications in PAVER.

Creating a Network

The first step in building a pavement inventory for a military installation, city, or airport is to create a network. A hierarchical structure exists for pavement inventory items in PAVER 5.0. Networks are the parents of branches, and in turn branches are the parents of sections. In order to create pavement branches and sections, you must first create a network.

To create a network, click on the **Inventory** button on the PAVER button bar. The inventory data form appears with the **Network** file card displayed. Click the **New** button at the bottom of the Network file card, which populates all fields identifying the current network. The fields on the network form for **Network ID**, **Name**, and **Comments** should be edited to the desired values. You may also enter data in any **User Defined Fields** that you have created. See the above section on how to use the functions located at the bottom of the inventory file cards.

00001-INEWM-01

| 1. Network | 2. Branch | 3. Section |

Network ID: [00001]   Network Name: [USACERL]

Comment: [Network for USACERL Roads]

User Defined
Fields: Network User Sort 1

Images (0)   New   Copy   Delete   ☑ Track Selections   Close   Help
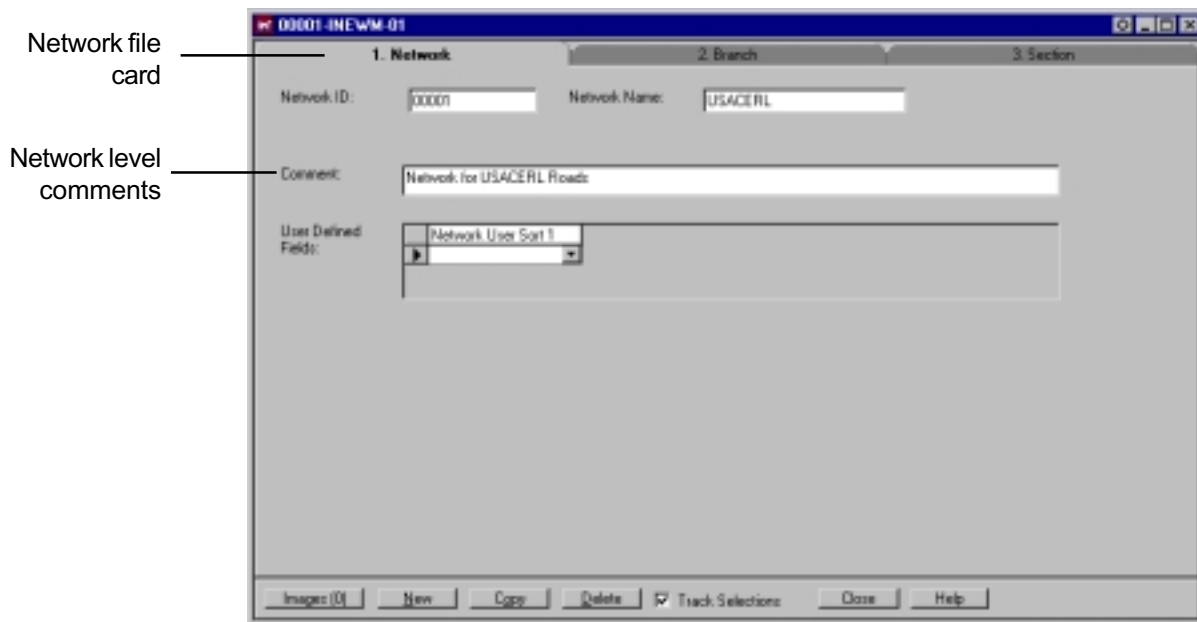
Creating Branches

To create a branch, click the **Inventory** button on the PAVER button bar. The inventory data window appears with the **Network** file card displayed. Click the file card tab **2. Branch** for access to the Branch file card. If you have just added a new network, that network will have no branches defined. Click the **New** button at the bottom of the file card to enter a new branch. The fields on the branch data entry form becomes populated with the label "new" or is blank (depending on the type of field, i.e., text, numeric, or pick list). Enter the appropriate values. Some fields are locked. They automatically respond to section data once sections for the branch are created.   For more specific information on how to use the functions located at the bottom of the **Branch** card, see the section on **Managing Pavement Inventory**.

Note

You may add items to the **Use** pick list under **Define User Fields** in **System Tables** if the choices are not adequate.

The contents of the **Use** field are limited to a single value that is selected from a preexisting list of choices. To enter a value in the **Use** field, select the field. A down arrow appears on the right side of the field data entry area. Click once on the arrow and a list of available choices appears in a scrolling pick list. Select an item from the list by pointing to the item with the mouse and pressing the left mouse button.

If there are more items in the list than can be shown in a single short list (usually 5 to 10 items), the list is displayed with a scroll bar arranged along the right side of the list. To select an item not visible in the list, point to the scroll bar down arrow with the mouse and press the left mouse button. The list scrolls down. To scroll back up the list, point to the up arrow on the scroll bar and press the left mouse button. When the pick list is very long, you may want to locate items in the list by typing the first character of your selection. The program seeks out matches for the characters you type. To use the seek feature, select the pick list field you wish to edit and type the first character of the selection you want and the pick list moves to the characters you type.

If the pick list does not contain the item you wish to enter, you need to add the item to the pick list. To enter a new item to the **Use** pick list, select **Tables** from the PAVER Menu located along the top of the PAVER screen. From the **Tables** sub-menu, select the **Inventory Pick List** selection and then the **Branch Use** tab. See the <u>System Tables</u> section under <u>Inventory Pick Lists</u> for further instructions.

The **Branch** file card contains three area fields: **Sum of Sect. True Area**, **Area Adjustment**, and **True Area**. The **Sum of Sect. True Area** field is the sum of true section areas of the branch. The **Area Adjustment** field is used to reflect special knowledge you have about branch area that is not incorporated in the **Sum of Sect. True Area**. Decreases in branch area should be entered as negative values. Note that the **Section** card also has an area adjustment field **(Section Area Adjustment**) so you do not need to reflect section level area adjustments in the branch **Area Adjustment** field. **True Area** is **Sum of Sect. True Area** plus **Area Adjustment**. **True Area** is the value used in PAVER calculations and reports.

Branch file card ———

You may create your own branch uses if **Use** options are not adequate

These fields may be configured by the user

Creating Sections

To create a section, click on the **Inventory** button on the PAVER button bar. The inventory data form appears with the **Network** file card as the active form. Click the file card tab **3. Section** to make the **Section** data card the active form. If you have just added a new branch, that branch will have no sections defined.

Click the **New** button at the bottom of the screen to enter a section. Enter section information in the rows of fields starting with **Section ID**. The **Calculated Area** is calculated based on the **Length** and **Width** information you enter. The **Calculated Area** field cannot be edited. The **True Area** field defaults to the value in the **Calculated Area** field. However, this value can be adjusted to reflect cut outs or other adjustments affecting the actual section area in the **Area Adjustment** field. Although the **Area Adjustment** field is useful for irregularly shaped sections, you must still enter **Length** and **Width** information. Failure to do so will create problems in other functions of PAVER.

The **Unit** field cannot be directly edited by the user (see **System Tables** section under **Misc. Other Tables/ Unit of Measure (Field) Settings** on page for details).

Some of the section fields can only be changed using the choices in the pick lists. Pick list choices can be edited or expanded through the **Tables** button above the PAVER button bar. (See **System Tables** section under **Inventory Pick Lists** on page 41 for further directions.) After the basic section information, there are two boxes, **Conditions** and **Families**. Condition information cannot be edited from the **Section** file card. Condition information can be entered in the routines run from the **Field Inspect** button on the PAVER button bar. The family assignment for the section (or other sections) can be changed by using the mouse to point at the **Family** box and double clicking the left mouse button. Family information can also be assigned under the **Pred. Model** button.

The **Section** file card contains three area fields, **Calc** (Calculated) **Area**, **Area Adjustment**, and **True Area**. The **Calc Area** field is the product of the section's length times width. The section **Area Adjustment** field is used to reflect special knowledge you have about section area that is not incorporated in the area calculation. Decreases in section area resulting from items like cut outs should be entered as negative values. Note that the **Branch** file card also has an area adjustment field (**Area Adjustment**) so you do not need to reflect Branch level area adjustments in the section **Area Adjustment** field. **Calc Area** and **Area Adjustment** are added to obtain **True Area**. **True Area** is the value used in PAVER calculations and reports.

Three user defined section fields are arranged along the bottom of the screen. These fields are used to contain user defined inventory information and can be used to sort and select inventory, maintenance, and inspection information.

Section file card

Use **Area Adjustment** to reflect cut outs

Conditions/Families

This tab provides a quick reference to condition and family assignment data for the selected section in four preset views:

• **View all latest conditions** – This produces a table with the latest (last computed or last entered) condition indices associated with this section.

• **View one condition index for all dates** – This shows every date that one selected index occurred for the current section. A drop down-box allows you to choose the condition for which you would like to display information.

• **View all indices and dates** – This is the complete listing of every condition index for every date occurrence listed in the section history.

• **View family assignments** – This shows what the current family assignment (Prediction Model) is for the selected section. Double clicking in the **Family** column opens the **Change Family Assignments** window, providing you the option to change the family assignment.

As with other tables in PAVER, right clicking on any of these tables will allow you to revise the table layout, sort the data, print, or export the data.

Condition and Age Categories, Condition Type Selection, and **User-Defined Distress Indices** are all discussed in **System tables** under **Condition Types.**

View the conditions and family assignments for a section

Note

The **Conditions/Families** tab provides a quick way to see the conditions associated with all construction and inspection dates.

EMS Image Viewer

The **EMS Image Viewer** manages the saving, recalling, viewing, and enhancing of pictures, drawings, and other stored images in the PAVER program. **The EMS Image Viewer** is accessed from the **Inventory** section of PAVER 5.0. The network, branch, and section cards of the **Inventory** program each have a button located along the bottom of the form labeled **Images**. In order to edit pictures for a specific network, branch or section, the item must be actively displayed in the inventory data window at this time. To open the **EMS Image Viewer**, click on the **Images button**.

Edit how images are stored

Adjust images or add special effects
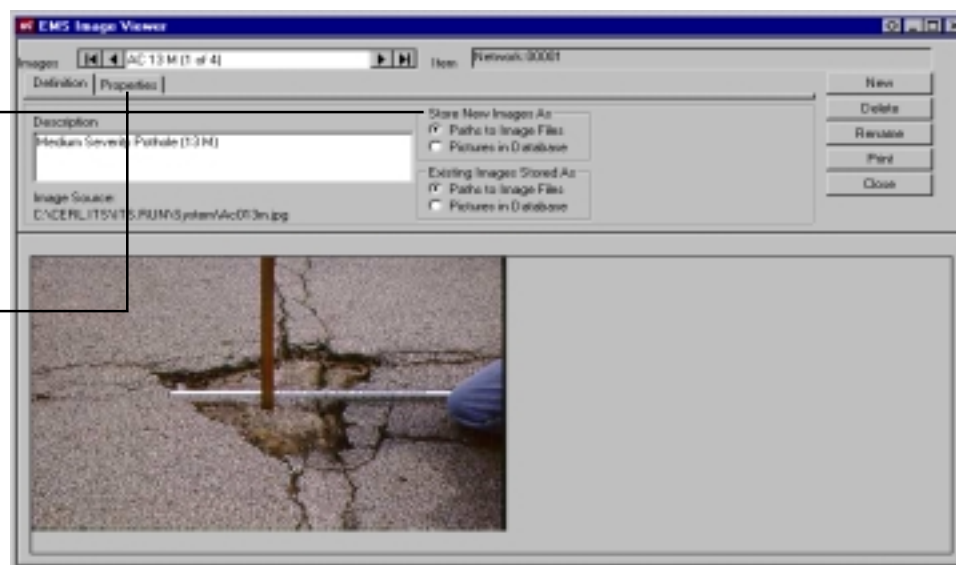
Store an Image

In the **EMS Image Viewer** window, there is a box titled **Store New Images As**. The options offered for storage are **Paths to Image Files** or **Pictures in Database**. Since image files are typically large, including them in the database substantially increases the size of a database. An alternative is to attach the picture to the database through a "path" to the image. The image would be stored in a fixed location, and PAVER would simply set up a path link to the image. However, an image stored as a path will not be included in the e50 file when the e50 is created for storage or transfer. In order for the images to follow the database, you will need to copy and send the images separately, making sure to place them in the same path on the new machine as they were in on the original. Select appropriate storage option and click on the **New** button. You are prompted to select the file containing the picture you wish to load. The drop box at the bottom of the window is used to specify the format for the picture. PAVER supports images stored in JPG, TIF, GIF, BMP, TGA, PCX, and PCT formats. Once you have selected the image file to add, use your mouse to click the **Open** button. The image appears in the **EMS Image Viewer** window.

If you wish to change the storage option for an image later, select the image and change the selection in the box tilted **Existing Images Stored As**.

Viewing Images

To view and select an image from the list of saved images, use the scrolling tool at the top of the window. If you add only one image for an inventory item, it always appears in the in **EMS Image Viewer** window when you access the **EMS Image Viewer** for that inventory item. However, you may associate more than one image with an inventory item. When multiple inventory images are associated with an inventory item, you can scroll through the images by clicking the image scroll buttons located on the upper left corner of the **EMS Image Viewer** window.

Edit an Image

There are two tabs in the **EMS Image Viewer** window, **Definition** and **Properties**. Clicking on the **Definition** tab allows you to view the selected image and to determine how the image is stored.   Clicking on the **Properties** tab will allow you to make various graphic adjustments to the image as well as add a variety of special effects. Click on **Edit** for the desired feature and click on OK once you have made your adjustments. A preview of the image will be shown in the **EMS Image Viewer** window.   Save changes by clicking on **Save Edits** or restore the original image if the change is undesirable by clicking on **Restore Image**.

Other Image File Options

Five other commands are available in the **EMS Image Viewer** window:

• **New** - A new image is attached to the network, branch, or section that was active when the **Image** command was invoked.

• **Delete** - The current image in the viewer is deleted.

• **Rename** - This renames the image within the viewer, but it will not change the file name.

• **Print** - This command invokes the Windows "Print" window for printing a copy of the selected image

• **Close** - This closes the **EMS Image Viewer** window.

Work

Extensive connections exist in PAVER between construction date and predicted PCI. The system must have an accurate account of the last construction date for each section in order to accurately predict future pavement performance, maintenance requirements, costs, and inspection schedule. PAVER updates the last construction date for the section to correspond with the most recent major M&R. The **Work History** and **Required** forms provide an interface for easily entering work history data of a particular pavement section.   In order to enter work information for a particular section, it must be selected in the **Select Inventory Item** window.

For a new record, click on **New**, then enter the information either by typing or selecting from a pick list of options. You may edit entries by typing over those in existence. Micro PAVER does not allow the user to delete ALL of the construction dates in a work history profile. If there is only one construction date, the entry cannot be removed. The **Copy** button invokes the **Copy and Move Data** utility - described in a following paragraph - and can be used to move other data elements, to compatible places in other areas of the database. In this case, work records will be copied or moved.

Maintenance, repair, and construction activity information is recorded on the **Work** file card. The **Work** table is subdivided into **History** and **Required** tables. Future or planned work is entered into the **Required** table. When the activity has been completed, scroll to the last column of the **Required** table and change the **Work Completed** field in the **Work Required** table to indicate **Yes**. This will cause the record to be transferred to the **Work History** table. If you select the **History** tab, the table refreshes and the completed work activity will then be part of the **Work History**.

The **Graphs** tab also contains a graphic component that presents graphs for each section relating condition and work history.

Graph tab

Work tab components, History and Required
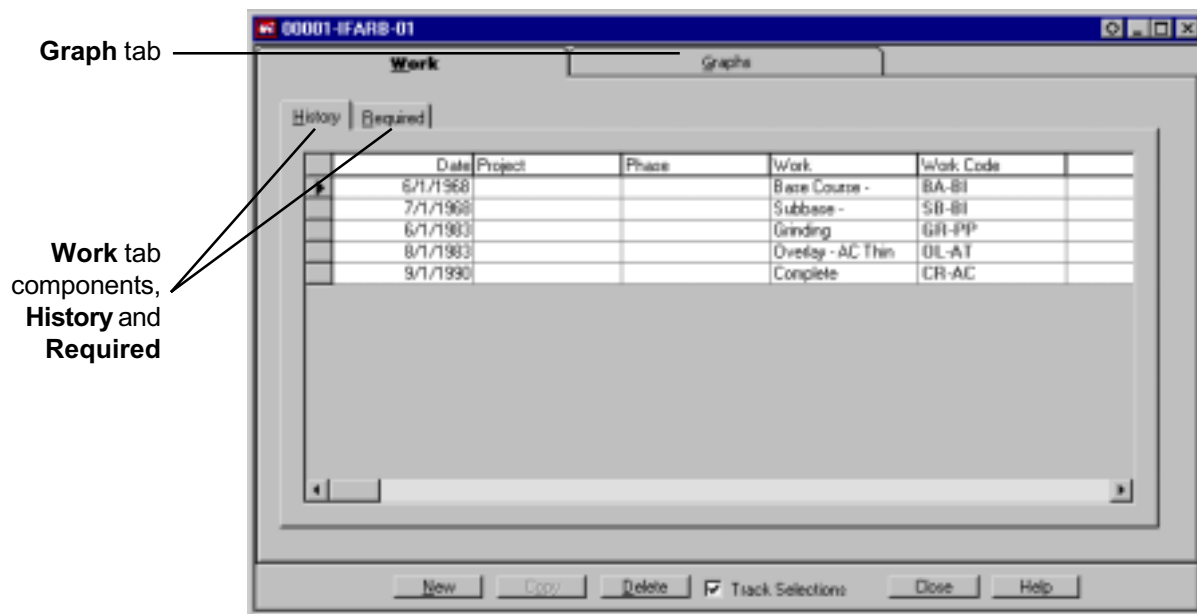
Traffic

This window is for entering previously collected traffic data. The **Traffic** table has a special copy feature for replicating information to multiple sections. Click the **Copy traffic to rest of branch** button to copy the information for the active traffic section to the other sections in the branch.

NDT and Test

This window contains two tabs, **NDT Tests** and **Other Tests**. These tables are for the collection of basic pavement test results.

Copy and Move Data

This new data manipulation tool included in PAVER 5.0 allows you to move or copy any available inventory item from one location to another. First, select the inventory item you wish to move or copy under **Source**. Then, select the **Destination** for the inventory item you wish to move or copy. **Move** relocates the item to the specified location, while **Copy** leaves the original in its location and place a copy in the specified destination. The **Move** and **Copy** buttons remain "grayed out" until an acceptable combination of source and destination locations are chosen. For example, you cannot move a network into a section. All data movement is restricted within the open database. To move data items between databases, you will have to combine databases using **Combine/Subset Database** described in **Database Tools-Combine/Subset Database** on page 29. After two databases have been combined, move or copy the data items and split the database back into its original components.

The **Copy and Move Data** utility also allows you to delete and rename items by high-lighting the appropriate item and clicking **Delete** or **Rename** under the Source side. Also, you can use the **EMS Query Tool** to eliminate any data you do not want to view by selecting **Subset** from the **View** box and clicking on **Select**. The **Generate Selections** and **Respond to Selections** check boxes link the **Copy and Move** utility with the other selector tools. For all components of PAVER that use inventory items (Network, Branch, and Section), there is one active selection. Therefore, you can use the **Copy and Move** utility to **Generate selections** in other inventory selectors or the **Copy and Move** can be selected to **Respond to selections** made by another selector.

Select inventory item

Set interaction with selectors

Inspection

PCI and Distress Indices

Field Inspection - Basic Operations

Collecting and recording of field inspection data are probably the most frequently re-
peated tasks in PAVER. The **Inspection** component of PAVER can be launched from
the **Visual Menu** under **Inspection** or from the **PAVER Button Bar** via **PCI**.

Entering Inspection Dates and Samples

To enter inspection information, first verify that the desired network/branch/section is
selected using the **Select Inventory Item** window. Notice that the name of the window
corresponds to the network/branch/section that is currently selected. The **Inspection**
drop-down box allows you to select a previous inspection by the inspection date. This is
useful if you need to add or edit information for a previous inspection. If you wish to
enter information for a new inspection, click the **Edit** button next to the **Inspection**
window. The **Inspections** window appears, displaying a list of past inspections. Click
the **New** button and a new inspection, with the current date, appears at the top of the list.

Select Inventory Item window

Create a new inspection

When you first create a new inspection date, the new inspection has the same sample information as the previous inspection. If the actual inspection date is different, click on the date and edit it. You may also edit the other fields in the window, including entering a comment for the inspection. When the inspection date and other fields are as desired, press the **Close** button to return to the **Inspection Data Entry** window; the most recent inspection will be the currently selected one.

Edit inspections window

Past inspections listing

Create a new inspection

Similarly, if you want to enter comments for an inspection date, click on the **Insp. Date** – **Comments** box and enter a comment (text string), which is stored with that inspection date. To check the comments on any given date, make the date current in the date window and click the **Insp**. **Date** – **Comments** box to view the contents.

PAVER uses sampling techniques for performing inspections. While you can inspect each section in its entirety, it is not practical to do so. It is acceptable to inspect only portions of a section. To use this technique, each section is divided into smaller pieces called sample units. Inspection information is collected from one or more sample units.

The PAVER **Inspection Data Entry** window matches the field inspection, and allows you to enter your survey information. Click the **Edit** button, next to the **Sample** window, to bring up the **Select Samples** window. The **Select Samples** window contains two lists. The left side shows the samples to be included in this inspection. The right side shows samples that were used in previous inspections. To use a sample defined in a previous inspection, click on the sample and then click the arrow button located between the two lists.

To add a completely new sample, click the **Add New** button. A sample is added to the end of the list with the **Sample Number** of "New" and a **Sample Size** of zero. Click on the **Sample Number** field and change the ID to the sample ID used in the actual field inspection. You may also enter a comment for the sample and switch the **Sample Type** between **R** (Random), and **A** (Additional).

If there is a sample definition in the left hand list that you do not wish to use, click on the sample you wish to remove, then click on the **Remove** button. If the sample already has inspection information (as can occur when editing the sample list for an existing inspection), PAVER informs you that the sample already contains information, and asks you to confirm that you really wish to delete the sample and any inspection information within the sample.

Entering Inspection Information

<div style="border:1px solid; background:yellow; padding:8px;">

Note

You may enter duplicate distress type/ severities. For example:

Alligator L 50
Alligator L 40

</div>

The PAVER **Inspection Data Entry** window is designed to be easy to use, while allowing experienced users to rapidly enter large amounts of inspection data. Once you learn the basic operations and become familiar with the window, it is possible to enter all the inspection information for an entire section using only the keyboard.

Once the section is selected and the inspection date and samples are set up, you are ready to enter the individual distresses. Click on the distress code and description, then click the desired distress **Severity** level, then click the **Quantity** field and type in the distress quantity. Note that the distress codes available in the list depend on the type of pavement you are inspecting, since some distresses are only found on a particular surface. Similarly, when you choose a distress code, PAVER modifies the available severity levels since some distresses cannot be assigned a severity level.

After you have entered the **Distress**, **Severity**, and **Quantity**, click the **Add** button to add the distress to the list. Similarly, if you want to delete an existing distress from the list, highlight a row by clicking on it and click the **Delete** button. The **Replace** button deletes the highlighted record and replaces that information with the current **Distress/ Severity/Quantity** information. If you wish to enter a comment for the distress, click on the **Section Comments** button in the list of distresses.

Once you have entered inspection data for an entire sample, proceed to the next sample in the list by choosing another sample from the **Sample** drop-down box. You may also review previously entered data by using the **Sample** drop-down box.

Distress codes and descriptions

Severity level

Quantity field

Distress summary for a sample unit

For Maximum Speed - Keyboard Only

The most repetitive part of inspection data entry is inputting the distress data. Once familiar with the PAVER **Inspection Data Entry** window, distress data entry can be performed totally on the keyboard.

To perform keyboard-only data entry, first set up the inspection and sample information as described in the previous section. All distress codes are two-digit numbers, and are shown to the left of the distress descriptions. To enter "Bleeding", for example, type the two-digit code "02." A rectangle appears around the code and description. You may change the distress selected by typing a different code, or by moving the selection rectangle with the arrow keys.

Select the proper **Severity** by typing "L" for **Low**, "M" for **Medium**, and "H" for **High**. Once you type a severity code, the cursor immediately moves to the **Quantity** field where you can type in the distress quantity. Note that the entire **Quantity** field is highlighted, meaning that anything in the box is immediately overwritten by what you type. If the distress has no severity level, then the **Low**, **Medium**, and **High** options are disabled (gray). To skip the severity, press the Tab key twice. The cursor skips first to the N/A option, then to the **Quantity** field.

Once you have typed in a quantity, add the distress to the list by typing "A" for **Add**, or by pressing the Enter key. PAVER creates a new row in the list of distresses and signals you with a short beep or click sound to let you know the data has been entered.

To enter a comment, you need to use the mouse to click on the **Comments** field in the list of distresses entered and type in the comment. When finished, click on the next distress code and resume keyboard-only entry.

When you are finished entering all the distresses for a sample, move to the next sample by typing "N" for **Next**, or move to a previous sample by typing "P" for **Previous**.

Batch Inspection Data Entry

In order to expedite inspection data entry, you may enter multiple inspection records at one time. For video inspection data, it must be in a specified format. There are two options for video inspection data imports. One option requires six ASCII text files. The other option requires at least one of five tables in an Microsoft Access database. For specific format requirements, see **Appendix B**. After data is in the correct format and all files or tables are complete, begin the batch entry by selecting the option from the PAVER **Add-Ins** menu.

Calculating the PCI after Inspection

Within the **Inspection Data Entry** window, PAVER allows the user to view the condition of an individual section immediately after distress data is entered. To access this feature, click the **Calculate Conditions** button in the **Inspection Data Entry** window. The section properties are all displayed at the top of the window. In the middle of the window, Condition **Index**, Inspection **Date**, and **Condition** Value are all displayed. This window also gives you basic information about the section that you are viewing. This is a description of the information available by tab:

• **All Indices** – This tab displays the **Condition Value** for all conditions associated with the current section.

• **Individual Distresses** – This tab displays distress information for every distress entry in every sample of the current inspection date. Added to the information is the density of that distress and the corresponding deduct value.

• **Extrapolated Distresses** – This table shows each distress type (all identical distress type and severity levels from the previous tab are grouped together here) with the quantities adjusted to reflect the extrapolated value. With random samples, PAVER extrapolates the distress quantity across the entire section.

• **Sample/Distress Summaries** – The left side of this tab displays the number of samples surveyed and compares the total number of samples to the recommended number for a project level inspection. The right side of this tab groups all recorded distressed by type and calculates the corresponding percentages.

• **Sample Info** – General data about each sample involved in the inspection is included here.

Again, right clicking any table provides **Print** and **Export** options. There is also a **Print** button at the bottom of the window.

Other Conditions

User-Editable Condition Indices

PAVER computes the value of the PCI (and all PCI related distresses defined in **System Tables/Condition Types/User Defined Distress Indices**). You may input all other condition index values in this table. The value can be accessed and utilized in other areas of the program, but the input is manual. Click on the field next to the condition index you would like to use (in the **Value** column) and type the data in directly. To add, remove, or edit the list of indices, click on the **Select Indices** button. This activates the same table viewed when **Condition Type Selection** is selected via **Visual Menu**...**System Tables**...**Condition Types** (see **System Tables** under **Condition Types**). **The Inspection Date Comment** button allows you to view the comments entered for this inspection date.

Inspection Data Import (PAVER Database)

Copying Inspection Data

PAVER allows you to copy inspection data from one version of a database to another copy of the same database by using the **Inspection Data Import.** This can be useful when it is desired to copy the inspection information that was entered in one database to another similar database. To get started, click on **Inspection Data Import (PAVER Database)**. This is located on the **Visual Menu** under **Inspection**.

A Windows dialog box appears on the screen asking for the database file from which you wish to copy the inspection information. Once you have located the correct database file, a PAVER box appears and asks which inspection dates you wish to copy to the online PAVER database. Select the appropriate dates from the list, click OK, and the inspection data is imported.

Inspection Schedule

Inspection Schedule Report

The **Inspection Schedule** report selects sections for inspection subject to minimum condition criteria or projected deterioration rates. The **Inspection Schedule** report operates like the **Condition Analysis** report and the **M&R Work Plan** report. When the report is opened, you may configure the parameters to be used with the report and then execute the report. The completed report is presented in the **Report Viewer**.

Start the **Inspection Schedule** report from the **Visual Menu** by selecting **Inspection Schedule** and then **Inspection Schedule Report** from the sub-menu. Select the sections to include in the report with the **EMS Query Tool** on the **Scope** tab. **All** can be selected to include all the sections in the active database, or select **Selected Items** - **Edit Selection** and use the **EMS Query Tool** to build a subset of sections. The **Timing** tab is used to specify the scheduling period.

The **Mode** tab is used to configure the method for selecting pavement sections to inspect. Select the **Schedule All Sections** to specify a complete inspection. Use the check boxes to enable or disable the **Min Condition** and **Use Deterioration Rate To Schedule** options. These options may be run together or separately. A third element for the report is to generate a **Re-Inspection Report**. The **Re-inspection Report** option is turned on or off by using the **Yes/No** selector buttons, selecting "Yes" generates a re-inspection report along with the inspection schedule (A description of the **Re-inspection Report** is included in the **Reports** section).

Select type of report

Select and edit the **Condition Table**

Select **Scheduling** options
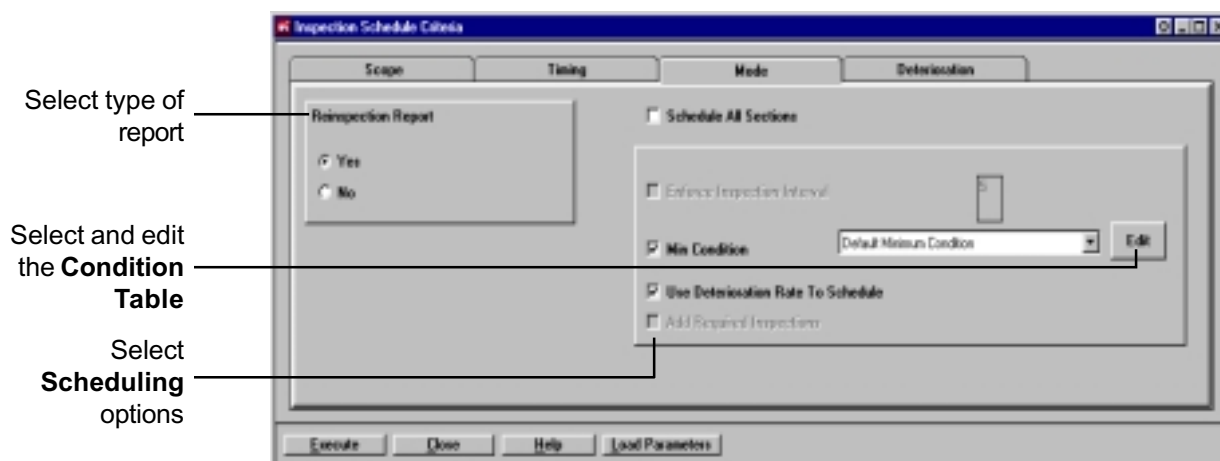
You may choose to schedule inspections according to a table of minimum acceptable conditions, if desired. If the **Min Condition** box is checked, projected section conditions are compared to a list of minimum conditions, and a section is only scheduled for inspection if that section's condition falls below the matching record in the minimum condition table. When the **Min Condition** alternative is selected, you may specify a minimum condition table. Use the drop-down box immediately to the right of the **Min Condition** check box to select a table of acceptable minimum conditions. The **Edit** button can be used to review the selected minimum condition table. If the table is viewed, a list appears separated by **Branch Use**, **Section Rank**, and **Year**. For each row, there is an associated minimum condition. The table of minimum conditions can be viewed and edited from here.

If the **Use Deterioration Rate To Schedule** box is checked, the table on the **Deterioration** tab allows you to configure the relationship between deterioration and inspection frequency. PAVER checks the rate of deterioration for a section included in the report and categorizes it based on the numbers placed in each rates of deterioration category.

Enter years between inspection
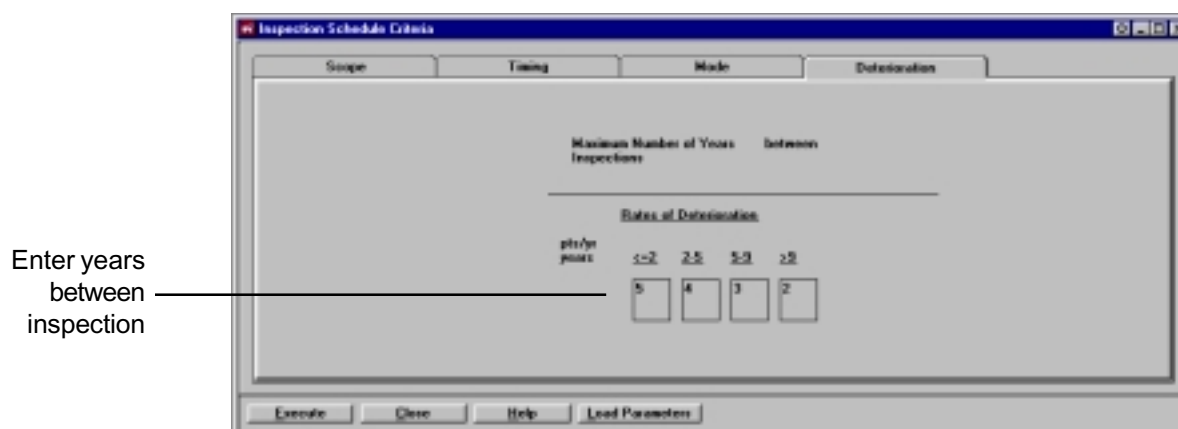
Run the **Inspection Schedule Report** by clicking the **Execute** button. The **Inspection Schedule Report** is presented in the **Report Viewer** with the default view as a summary of inspections per year. To obtain a version of the report that lists the individual sections inspected for each year of the report period, click on **Go to Detail**. When closing the report, PAVER will asks you if you want to save it. If you respond "Yes", it creates a file name of your choice (with an "RPI" extension).

Open Saved Report

This is the utility that allows you to open an RPI file – a saved inspection schedule. Simply search to the directory where you saved the RPI, double click the file name, and it opens in the same view as when you originally created it.

Family Assignment

Change Family Assignments

Family assignments can be made when a section is defined in the Inventory module, or when a family model is created in the Prediction Model portion of the program. However, if you want to change a family assignment or rapidly assign families to sections, the **Change Family Assignments** routine provides an efficient routine for reviewing or adjusting family assignments. Some definitions for clarification include the following:

• **Family**: A group of pavement sections with similar deterioration characteristics.

• **Family Model**: The plot of observed age and condition measurements for pavements with similar attributes.

• **Family Type**: A pairing of a condition type and an event (such as age), for the purpose of plotting data points.

• **Family Assignment**: The process of assigning a **Family Model** to a section for use by the condition prediction engine.

Select **Family Type** and **Family Model**

Click to Assign and Remove Sections

Invoke **EMS Query Tool**
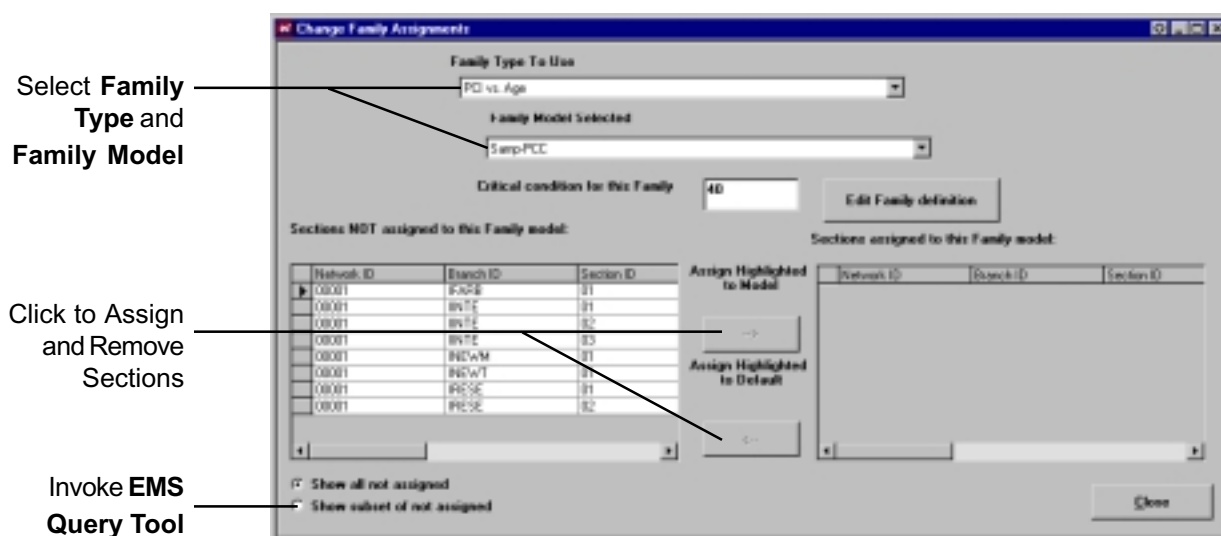
Change Family Assignments is accessed through the **Prediction Model** selection on the **Visual Menu**. After selecting a particular **Family Type** and **Family Model** from the drop down lists, PAVER displays all sections in the active database grouped into two categories: sections assigned to the current model and sections not assigned to the current model. The **Family Type** listings available in this menu are internal to PAVER and cannot be changed. The **Family Model** options, however, come from the **Prediction Model** and are user created. PAVER comes with a set of sample models.

To assign or unassign a section, highlight a section (or group of sections) and use the arrow buttons to move the section(s) into the appropriate category. You can assign a "group" of sections at one time by using the **Select Groups** option. Clicking on this button invokes the **EMS Query Tool**. From this point, you can design a query (i.e. Surface Type = PCC) and use that to assign all sections in the query to the current **Family Model**.

Reports

Summary Charts

Summary Charts is a feature designed to allow you to graph, and compare any two attributes of a database. For example, you can view the average condition of your network based on surface type. To access the **Inventory Summary Charts**, select the **Visual Menu** button from the **PAVER Button Bar** and choose **Reports** and then **Summary Charts**. At this point, the **Summary Charts** window appears and awaits your selection of a category to represent the X and Y axis. Using the drop-down boxes labeled **X Axis** and **Y Axis**, select an **X Axis** for the graph you wish to produce. The drop-down box for **Y Axis** selections is hidden until you make your selection for the X axis. The third drop-down box requests that you make a selection of which condition index you wish to use. Remember, for the charts to work properly, you must have condition data available for the index you have selected. PAVER automatically associates a PCI with every section in your database. Every other index requires that you either input the value manually or establish a definition for the index (discussed in detail under **User-Defined Indices**).

Define graph axes

Select the **Condition Type** to display

Choose **All Sections** or define a **Subset**
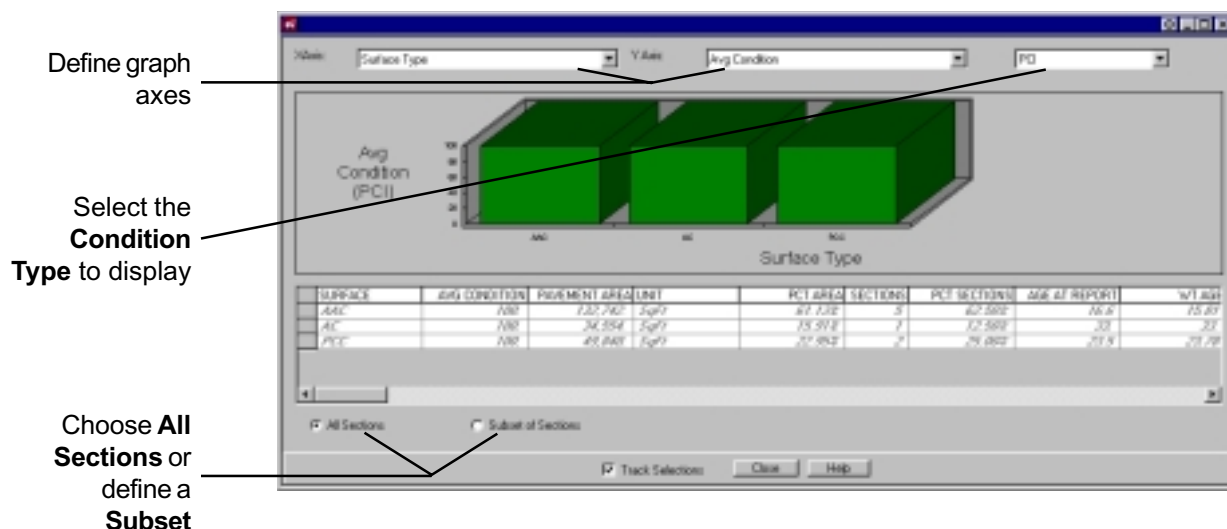
After you have made valid selections (some combinations may produce a null set of sections and hence no graph), the graph and data table below populate. For the table at the bottom of the page, dragging the border with the mouse can modify the field widths. A right mouse click on the table Produces the **Print**, **Export**, and other options for the table.

Standard Reports

There are four **Standard Reports**: **Branch Listing**, **Work History**, **Branch Condition**, and **Section Condition Reports**. These reports are accessed through the **Visual Menu** via the **Reports** option.

A brief description of each of the four **Standard Reports** is as follows:

• **Branch Listing Report** – This report produces a list of all branches and relevant information on each including usage, number of sections, total area, etc. The last page is a summary of all branches in the network (or networks).

• **Work History Report** – This produces a section by section report of all work completed within that section over the life of the database. Data such as work type, work date, and cost are included.

• **Branch Condition Report** – This is a display of the average and weighted average condition of each branch. Standard deviations are included, and a summary of all branches is included on the last page.

• **Section Condition Report** – This is the same as the branch condition report only the data is displayed at the section level. Again, a summary is included on the last page.

<table>
<tr><td>

Note

For **Standard Reports** there is no **Order Rows** tab in the **EMS Query Tool** since reports are created in a standard layout.

</td></tr>
</table>

The starting point for each of these reports is the same. Define the subset of the database you wish to run the report on by clicking on the **Selection Criteria** button. The subset can range from one section to the entire database which is the default if you do not establish **Selection Criteria**. Clicking on the **Selection Criteria** button opens the **EMS Query Tool**. Use of the **EMS Query Tool** has been discussed in previous sections.

When running the **Branch** and **Section Condition Reports**, one additional piece of information is required. Before the report can be executed, you must select which condition index is to be used. This is done by double-clicking on the desired condition in the **Condition Selection** box under **Methods**. This places that condition type in the **Selected** window, at which point you can proceed with the query or execution of the report. To deselect an item in the **Selected** box, double-click on it to send it back to the **Methods** box. Only one condition index can be used per report.

Select the desired report type

Double-click to select desired Condition Index
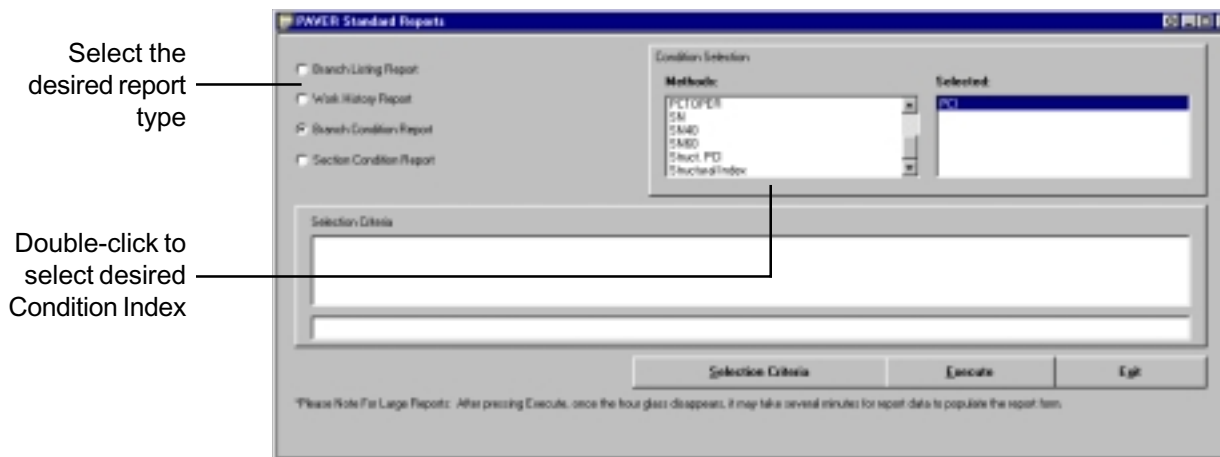
On the top of each of the reports is a tool bar, used to manipulate the report. Left and right arrow buttons are used to go forward and backward through the report. In between the arrows is a display of the current page and the total number of pages in the report. There is a print button and an export button to send the report to a printer or to a file for further manipulation. Finally, a **View Size** drop-down box allows you to size the report for ease of viewing.

Re-Inspection Report

The **Re-Inspection report** is designed to produce a listing of information about the last inspection for each section included in the report. The **Re-Inspection** window offers several options for configuring the report:

• **Distress Details** – This section gives you the option to display recorded distress information from the last inspection in three levels of detail (Remember: distresses are entered at the sample level and are associated with a specific inspection date.):

• **None** – No distress details shown.

• **Summary** – Distress code and severity level of each distress in the sample unit are shown.

• **Detail** – Complete details for every distress listed in the current sample are shown.

• **Calculate Sample PCI** – This produces a PCI for each sample listed. Although Paver works with Section level PCI's throughout the program, this shows the PCI of each inspected sample.

• **Report Sample Ordering** – This gives you control over how the re-inspection report sorts and orders the samples in each section – numerically or alphanumerically. Your choice is based on how you have chosen to name your samples.

• **Comments Print Options** – Checking any combination of these boxes enables the report to display comments that were entered at that level. Within the program, you can enter comments in a text field, at any of those levels – here is where those comments can be printed out.

• **Hand-Held Computer** – Selecting this option creates a file (extension INP) that can be downloaded to a handheld device for use during the inspection process. This file provides the handheld unit with all information necessary to perform an inspection on a section. To use this feature, select the **Generate Inspection File** box and type the path and name of the file you wish to create (using the INP extension). You can also click on **Browse** and point to the folder you will be storing the inspection file in. You still need to name the file – making sure to add the .INP extension in the name, and click **Open** to place the path and file name in the **File name** box. From here, you will run the re-inspection report as usual and Paver creates the INP file and places it in the path you specified, when the re-inspection report is finished.

Choose Distress Details to display

Select to include a PCI value for each sample

```
Re-inspection Report                                          [○][▬][□][✕]

Distress Details:           Comments Print Options:              Start
  ○ None                      ☑ Sections
  ○ Summary                   ☑ Inspections                   View/Print
  ⊙ Detail                    ☑ Samples
                              ☐ Distresses                       Quit
Calculate Sample PCI
  ⊙ Yes    ○ No


Hand-held Computer
  ☐ Generate Inspection File.
  Filename: [                                              ]  [Browse]

Processing Progress
  0% [                                                    ] 100%
        0% [                                              ]
```
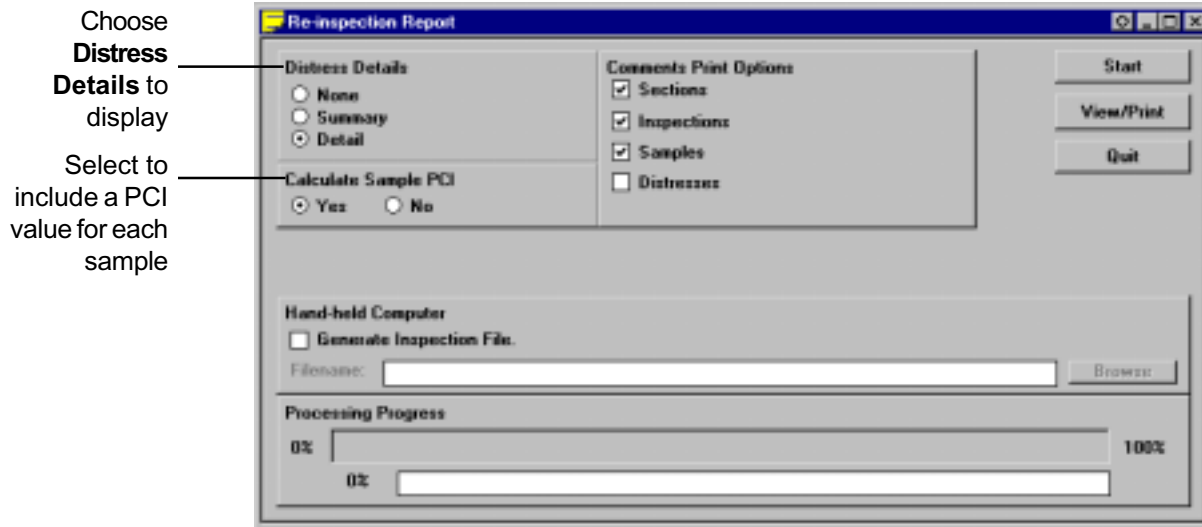
Now that you have configured your report, clicking the **Start** button creates the report. The next thing you see is the **EMS Query Tool**. At this point, you can select the whole database, or specific sections to be included into the report. When you say **OK** to the **Query Tool** (Saying **OK** to an empty query selects the entire database) the re-inspection report executes. When the progress bar indicates that the report is complete, clicking on **View/Print** displays the report. From this screen, you can view the contents, print the report, or export to a file or application. If you want to change any of the report parameters, simply close the view window, make the appropriate changes on the configuration screen, and select the **Restart** button.

User-Defined Report

The user-defined reporting tool gives you the ability to create your own report. The results of the report are displayed in table form that can then be printed or exported to another application (such as Microsoft Excel). As with other tables in PAVER, right click on the table to access the print and export options menu.

Opening the user-defined reporting tool produces the **EMS User-Defined Reporting Tool** window that offers three options: display a **Memorized Report**, **Create New Report**, and **Edit Current Report**.

Display a Memorized Report

This is a report that you have created and saved. It is available from the pick list at the top of the window. This report regenerates each time you select it, so all information displayed is current.

Create New Report

Click on the **Create New Report** button and the **EMS User-Defined Reporting Tool Definition** window appears. On the left side of the definition window, there is a tree that reflects your database structure. On the right side, there is a window with three tabs. Use the tree in the left side of the window to select a component of the hierarchy that contains the data elements that you would like displayed in your report. All associated elements are displayed in the left window of the **Select Columns** tab. You can scroll through the various levels of the tree in the left side of the window to see exactly which elements are associated with the different levels of the inventory structure.

In the right side, the first tab, **Select Columns**, requires you to specify the data items that are displayed in each column. Select individual components and move them to the window on the right side. All elements in this window become the column headers for your report. Only the elements you select from the center window and move to the right side are integrated into the report.

Select Rows invokes the **EMS Query Tool** and allows you to build the selection as you would in any other case that the **Query Tool** is used. Finally, the **Order Rows** tab allows you to order or sort the records in the table.

In between the two windows of the **Selected Columns** tab and the **Order Rows** tab, there are two types of arrows. Double arrows move all items in the window, and single arrows only move the selected item. If you choose to deselect an item, simply move it back to the center box, and it is removed from the list. The **Move Up** and **Move Down** buttons allow you to position the selected components in the desired order. The **Change Order** button, in the **Order Rows** tab, changes between Ascending and Descending orders for the selected components.

Store criteria to be used again as a **Memorized Report** format

Navigate through inventory components for data categories

Columns to be included in the report must be shown here
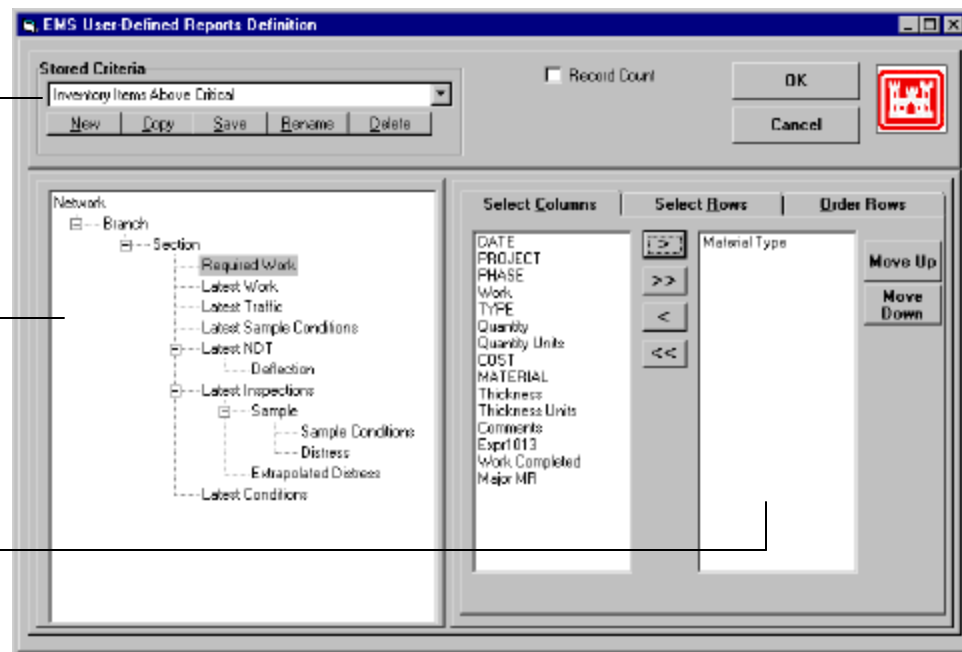
The **New**, **Copy**, **Save**, **Edit**, and **Delete** buttons, located in the top left of the window, become available to perform the corresponding actions as the circumstances allow. Previously saved formats are listed in the **Stored Criteria** drop down list.

Edit Current Report

The first step to editing a report is to select the desired report from the drop-down box at the top of the **Edit** window. From here, all of the same options from **Create New Report** are available. When the editing is complete, the changes take effect immediately and are reflected the next time the report is run.

To **Run** a report, simply select the report from the drop list at the **EMS User-Defined Reporting Tool** window, and the populated table appears. The report generates at the moment of selection so all data is current.

GIS Reports

The **GIS Reports** are a series of preset views that allow you to see a variety of information about your database in a graphical display. They are only available if you have a map linked to your database (see the GIS section for details on linking). The views are grouped into 2 sections: **Last PCI** and **General Info**.

To navigate these views, use the **GIS Viewer Buttons**. They function in the following manner:

• **Center** – Centers the current view at full extent

• **Pan** – Allows you to move around the view at the current zoom level

• **Select** – Activates the selector tool so you can use the GIS view as an inventory selector (See the section on "Selectors")

• **Zoom Area** – Allows you to block portion of the view to zoom in on

• **Zoom In** – Zooms in one level on the entire view

• **Zoom Out** – Zooms out one level on the entire view

• **Print** – Prints a copy of the view and the categories with color codes

Last PCI

This view displays the current/latest PCI value for each section in the view. This PCI value comes from the last inspection date (or last major M&R activity date). Going to **Tables** from the menu bar, and selecting **Condition Tools** and **Define Condition and Age Categories** can define the categories and values, as well as associated graph colors. In this table, on the **Condition Categories** tab, select **PCI** in the **Name** drop-down box, and you can make new categories, change names, assign numeric ranges, and manipulate color schemes.

General Info

Unlike the **Last PCI** view, **General Info** actually consists of four separate views:

• **Surface Type**

• **Category**

• **Rank**

• **Branch Use**

The categories and associated color schemes in these views are preset and cannot be changed. Since the **General Info** window has four views, only the *top, checked* view will be displayed. Each view name has a check box next to it. If only one box is checked, then only that view displays. If more than one view is checked, the view that is highest in location on the list displays. The up and down arrows under the views box can be used to move views up or down on the list. Highlight a view and use the arrows to move it to a different location on the list.

Blank Page

Prediction Model

Create and Maintain Prediction Models

Building Family Models

The essence of the prediction modeling (family modeling) process is to identify and group pavements of similar construction that are subjected to similar traffic patterns, weather, and other factors that affect pavement life. The historical data on pavement condition can be used to build a model that can accurately predict the future performance of a group of pavements that possess similar attributes. This model of pavement life is assigned a name, and in the PAVER vocabulary it is referred to as a "family."

Each pavement section in PAVER is assigned a family. When predictions about the future performance of a pavement are desired, a section's family assignment is used to predict a section's future condition. If the user has not assigned a family model to a section, PAVER will use its default family to predict future pavement performance.

However, factors such as original construction, maintenance, weather, and traffic, greatly affect the life of a pavement and a generic guess, one of which is the default family, is not likely to be as accurate as a model that takes these factors into consideration. The **Prediction Model** is designed to allow users to blend unique knowledge about their pavements, measured local condition information, and powerful modeling tools together to produce highly accurate estimates of future pavement life.

Note

When selecting a model, scroll and type seek capabilities are available if the number of saved models exceeds the length of the list.

Using the Prediction Model

Click on the **Pred. Modeling** button on the PAVER button bar. The **Prediction Model** can also be reached via the **Visual Menu**. A window titled "EMS Family Modeling" appears. The top half of the form is a graph that shows a sample start-up prediction model. Two drop-down boxes are located above the prediction model graph. By clicking the arrow on the right side of these boxes, you can select a **Family Type** and a saved prediction model. Select a model from the list. When you select a model, PAVER loads all the data points used to build the model and the settings used to generate the model. It then plots the data points and the estimated condition prediction function.

Choose Family Type

Family Model Name

Status of Boundaries and Outliers
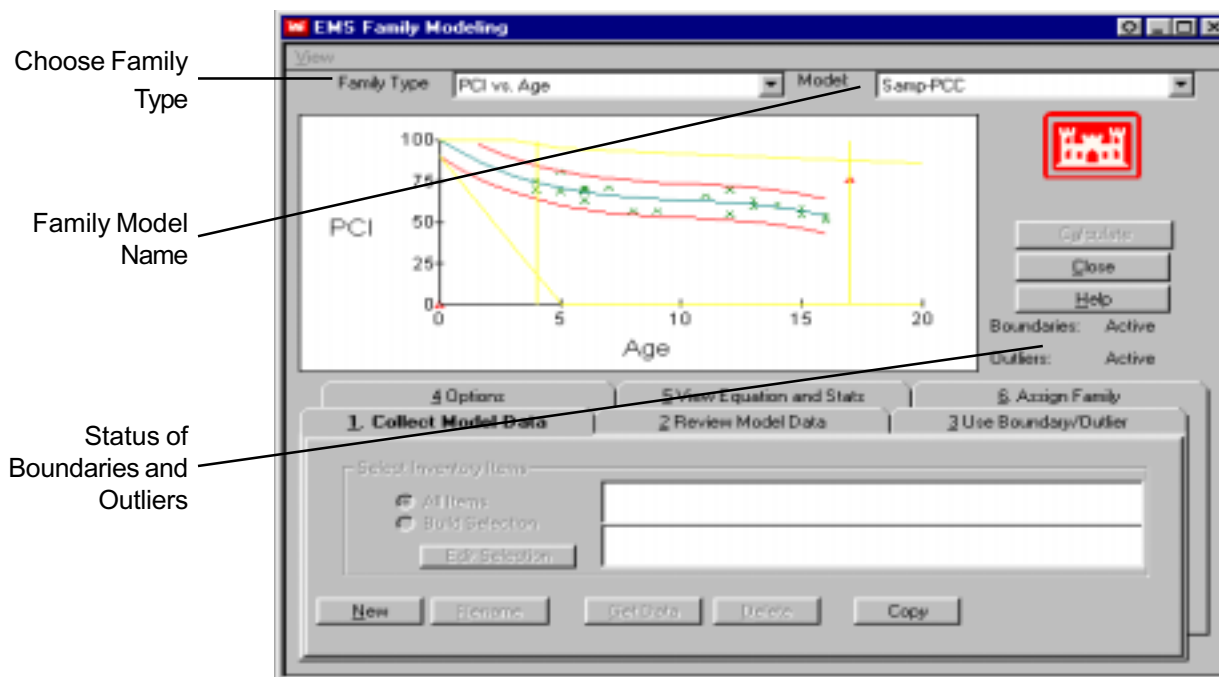
The upper right corner of the **EMS Family Modeling** form contains three buttons: **Calculate**, **Close**, and **Help**. The **Calculate** button causes the model to estimate the condition prediction function and plot the curve through the data points. The **Close** button closes the **EMS Family Modeling** window. Any models you have built are automatically saved when the **Close** button is clicked. "Help" is launched by clicking the **Help** button. The prediction model plot operates like other PAVER graphs. A right click on the graph displays the extended graphing features menu.

Located just below the **Help** button are the **Boundary** and **Outliers** status indicators. Once a model is selected or created, the **Boundary** and **Outliers** status indicators are activated. These indicators report the status of the boundary data filter located on card **3. Use Boundary/Outlier**, and the statistical outlier analysis feature that is configured on card **4. Options**. These options, and all other family model building variables, are configured on the index card style data entry forms located on the lower half of the **EMS Family Modeling** form.

Collect Model Data

This form is used to collect data from the active PAVER database and in order to build a new family model or to adjust an existing family model. To create a new model, click the **New** button. You are prompted to provide a name for the new family model being created (entries may be up to 16 characters in length). After naming your family model and clicking **OK** on the **Create New Model** form, the **EMS Query Tool** is presented so that you may select a subset if desired of the active database. After selecting the filter criteria (which can be none), the age verses condition points for the pavement sections selected are placed in the grid on the **Review Model Data** card as well as displayed on the graph.

The **Get Data** button at the bottom of the **Collect Model Data** card is used to modify the data used in an existing family model. After you click the **Get Data** button, you are prompted to overwrite the existing model data, append to (add to) the existing data, or abort the get data operation. The **Copy** button creates a new model based on the family model that was active when the **Copy** button was clicked. You are prompted to provide a name for the new model. Clicking the **Delete** button causes the active model to be deleted.
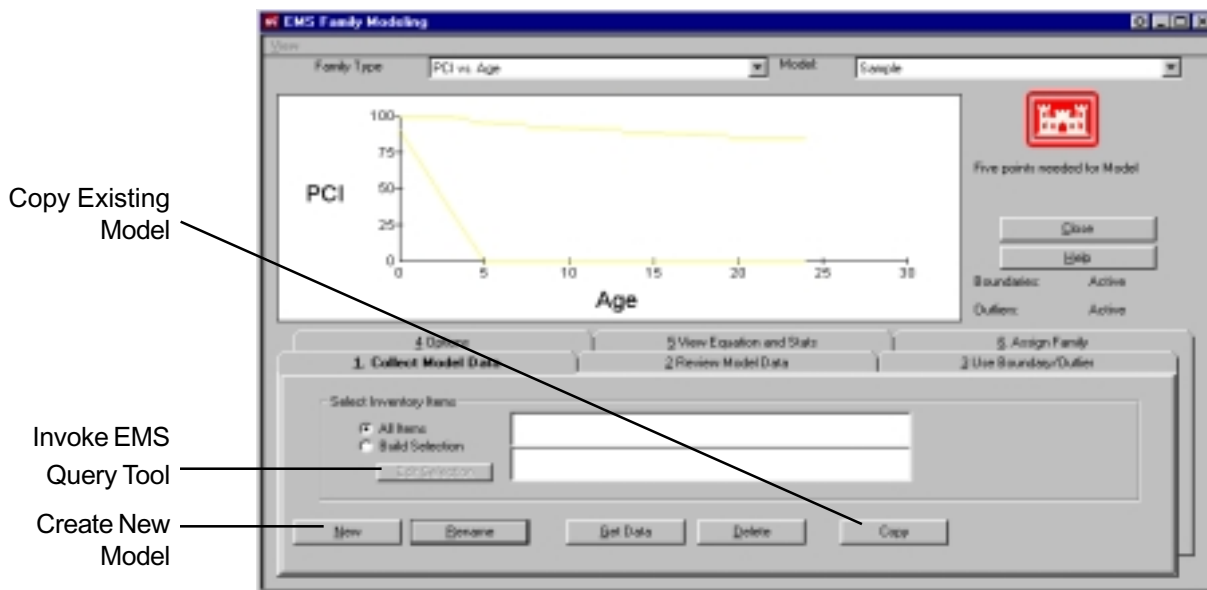
Copy Existing Model

Invoke EMS Query Tool

Create New Model

Review Model Data

This card presents data used to create the family model. Like other tables in PAVER, the extended features can be accessed by right-clicking on the table. The **Status** column contains no entry for records that are used to calculate the condition prediction curve. Points that are removed from the prediction process by boundary conditions or outlier analysis are labeled as "Out of Range" or "Outlier" points. You can add points to this table if you wish to influence the curve in a particular area. If any records are added or deleted, you must recalculate to refresh the graph.

Use Boundary/Outlier

Upper and lower model boundaries are specified on the **Use Boundary/Outlier** card. Age vs. PCI points that fall outside the boundaries are marked as "Out of Range" in the **Review Model Data** table and are not considered when the predicted condition function is estimated. Points marked as "Out of Range" can be reintroduced into the analysis by turning off the boundaries or shifting the location of the boundaries so those points are in the allowable range. The **X Range Filter** is used to specify a range on the x-axis from which you want to include data. Data points outside the range you specify are ignored.

Model boundaries are adjusted by changing the values in the table on the **Use Boundary/Outlier** card. To edit or change a value, highlight the row in the table you want to change. Then, select the column you wish to edit (year, lower or upper bound) and type the new value (numeric entries only).

New rows can also be added to the table with the right click menu. The **Add** option inserts a blank row in the last row of the boundary data table. Records in the boundary data table are sorted in ascending order by age (year). Edited and new records are out of order until the model is recalculated. You can force a recalculation of the model by activating any of the other index cards and then clicking the **Calculate** button. After the model is recalculated, the boundary table entries will be in proper sort order.

You can also set **X Range Filters** - minimum and maximum. Finally, the outlier boundaries are used to limit the number of data points used in the computation of the curve. Options for outlier constraints range from 50 to 100 percent. Changing these various options and recalculating produces different curve results. Use tab **5. View Equation and Stats** to determine the statistical soundness of your curve.

Adjust Model Boundaries

Set X Range Filters

Set Outlier Boundaries
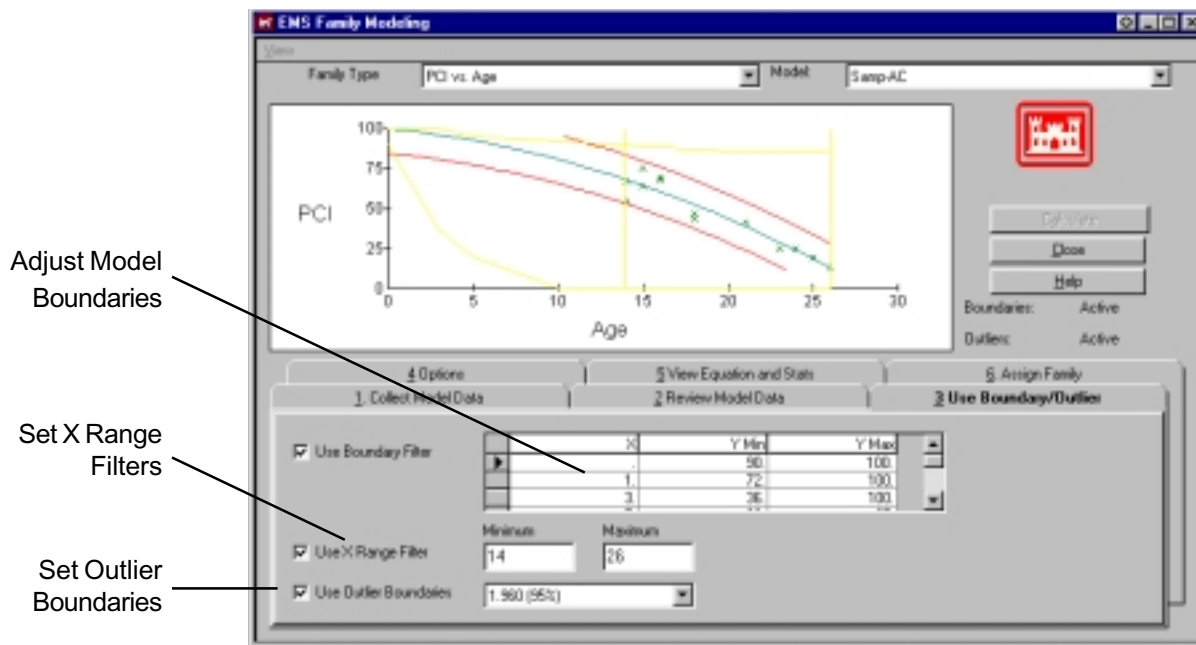
Options

The **Options** card is the heart of the statistical analysis performed in the prediction modeling tool. In the "Slope" section, you can choose to constrain the curve upward or downward, or leave it unconstrained. You also set the critical PCI for all sections assigned to this model by entering the value you wish in the "Critical Condition" window. To prevent changes to the model select the check box associated with the label **Prevent Changes to the Model**.

View Equation and Stats

The **View Equations and Stats** card displays the intercept and coefficient values for the equation estimated to be the best fit for the data. The card also lists various "goodness-of-fit" statistics for the estimated model.

Assign Family

Once a new family model has been completed, the **Assign Family** card can be used to assign the active family model to the pavement sections that were used to create the model. When you select the **Assign Family** card, the program checks the contents of **Review Model Data** card to build a list of the sections used to estimate the current family model. When you select the **Assign Family** card, the program first checks whether any sections in the current database are assigned to the selected **Family Model**. If the **Family Model** is not assigned to any sections, a message comes up indicating both that there are currently no sections assigned this model and asking whether you would like to assign the sections used to build the model (i.e. sections that fit the selection criteria on the **Collect Model Data** card). You may choose to assign these sections to the current family or continue without assigning the family to the sections.

Once the **Assign Family** card is active, the card contains a table and two buttons. The table lists the pavement sections in your database that are assigned the current family model. The two buttons arrayed on the card below the **Assign Family** table, **Add Members to Family** and **Remove Current Members**, are used to edit the pavement sections assigned to the current family model. To drop a section from the current family, highlight the section in family assignment table and click **Remove Current Member**. The section that is dropped is assigned the default family. The **Add Members to Family** button launches the same process as the **Edit Selection** routine on the **Collect Model Data** card. When you click the **Add Members to Family** button, the **EMS Query Tool** appears. You can use the **EMS Query Tool** to identify the sections you would like to assign the active family model to. When you have completed the query, the selected sections are added to the **Assign Family** table.

Other Condition Prediction Model Features

When the **Prediction Model** is open, a **View** menu appears at the top of the window. This option allows you to turn on and off various graphing features including **Boundaries**, **Outliers**, **Good Points**, and **Bad Points**. These features only affect the view of the data, not the underlying statistical routines. For example, if you use the view menu to turn off the boundaries, the boundaries do not appear on the plot of the graph. However, points in the model that do not meet the boundary conditions are still excluded from the modeling process.

Blank Page

Condition Analysis

Condition Analysis Report

Overview

The **Condition Analysis** feature allows you to view the condition of your pavement network, or any subset of the network you specify. The analysis is based on prior inspection data, interpolated values between previous inspections, and projected conditions based on family assignment. Once you specify the pavements that you would like to analyze and duration of time to be used, PAVER can predict the deterioration of your pavements. The **Condition Analysis** tool is invoked by clicking on the **Condition Analysis** button on the button bar or by going to the **Visual Menu** and selecting **Condition Analysis**, then selecting **Condition Analysis Report** from the sub-menu, and clicking on the **Continue** button. The **Condition Analysis** parameter collection window appears on the screen.

Configuring the Condition Analysis Report

Note

You can select a **Start Date** to show past condition.

When the **Condition Analysis** is selected, a window with two file cards appears. On the **Scope** card, the **Family Type** choices are **PCI v Age** or **IRI v Age**. At the left, two options are available for selecting inventory items to be reported: **All** and **Selected Items**. The default is set to **All.** Choose **Selected Items** to prompt the **EMS Query Tool** to select a subset or records for the report. After selections are made, the selection criteria is shown in the previously empty white box. The **Record Count** box shows the number of sections included in the current plan.

Behind the **Scope** card is the **Timing** card. Enter the desired date to start the prediction model in the box next to **Start Pred:**. Then, enter the number of **Years** to report. The report includes historical information and predicted condition for selected sections for each year for the selected number of years.

You can use previously saved report parameters using the **Load Parameters** button at the bottom of screen. A dialog box asks from where to load the report. **Condition Analysis** report files typically carry the extension "RPC." After loading the report parameters, you may change them as needed, then run the report.

Select portion of inventory to analyze

Check to display number of records

Enter duration of the analysis

Enter the starting point for the analysis

Run the analysis
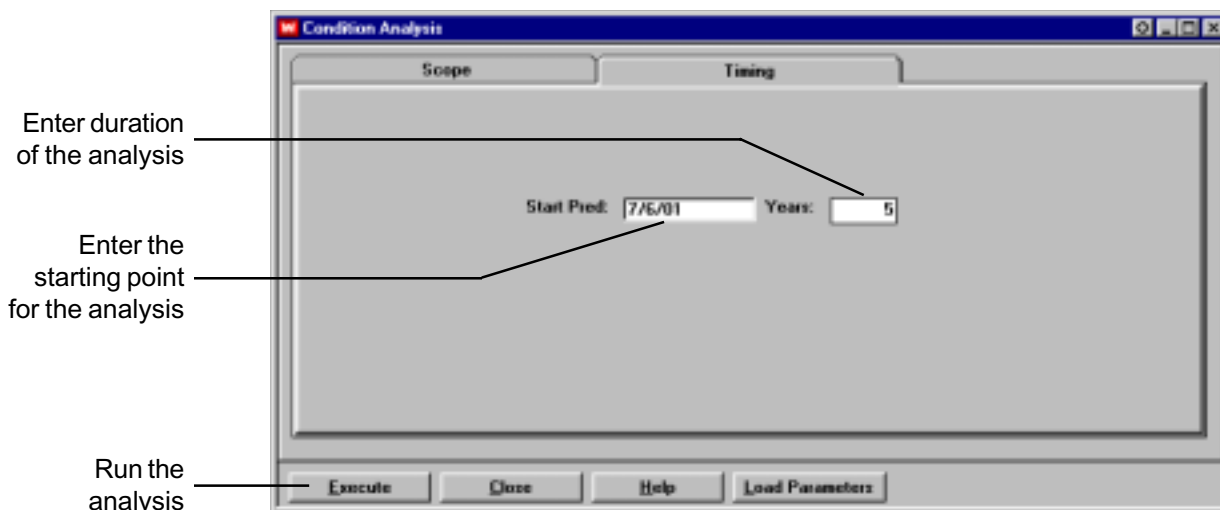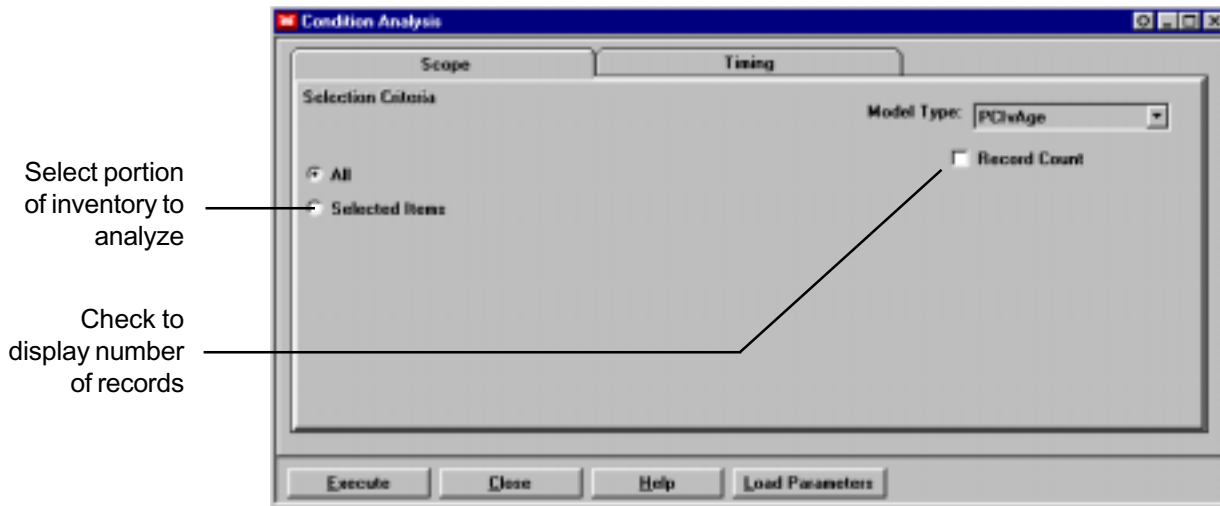
Analyzing Pavements

Once you have configured the report, click the **Execute** button to start calculating the report. When the report calculations are completed, the **Condition Analysis Report** is presented in the **Report Viewer** tool. The default presentation of the report is a summary of conditions that includes two tables with corresponding graphs. The summary view includes the **Annual Condition (Arithmetic Average)** table that shows the average condition for each branch, for each year in the reporting period. The first row of the condition summary table is the average condition of all branches included in the report. The condition summary table is accompanied by a graph that plots the average condition for the highlighted branch (row) in the condition summary table.

The second view is the **Condition Frequency (% Area)** table and associated graph. The condition distribution table presents a histogram for each year of the specified reporting period with sections grouped into seven PCI categories (excellent, very good, good, fair, poor, very poor, and failed). The condition distribution graph presents a histogram for the highlighted year in the condition distribution table.

The **View** menu in the **EMS Report Viewer** can be used to add or remove tables and associated graphs from the report viewer screen or to switch between the summary and detail version of the report. To turn off one of the summary tables and its associated graph, select **View > Summary** and then select the table that you want to turn off. Tables and graphs that are active in the current report view have a check mark to the left of the table or graph name.

As usual, in order to zoom on a table or graph, right click on the desired object and select zoom. Other options can be selected with a right click such as: **Revise Layout**, **Change Sort Order**, **Export** and **Print Table**.

Click to add/
remove tables
from view

Switch to the
Detail View

Default
**Summary
Views**
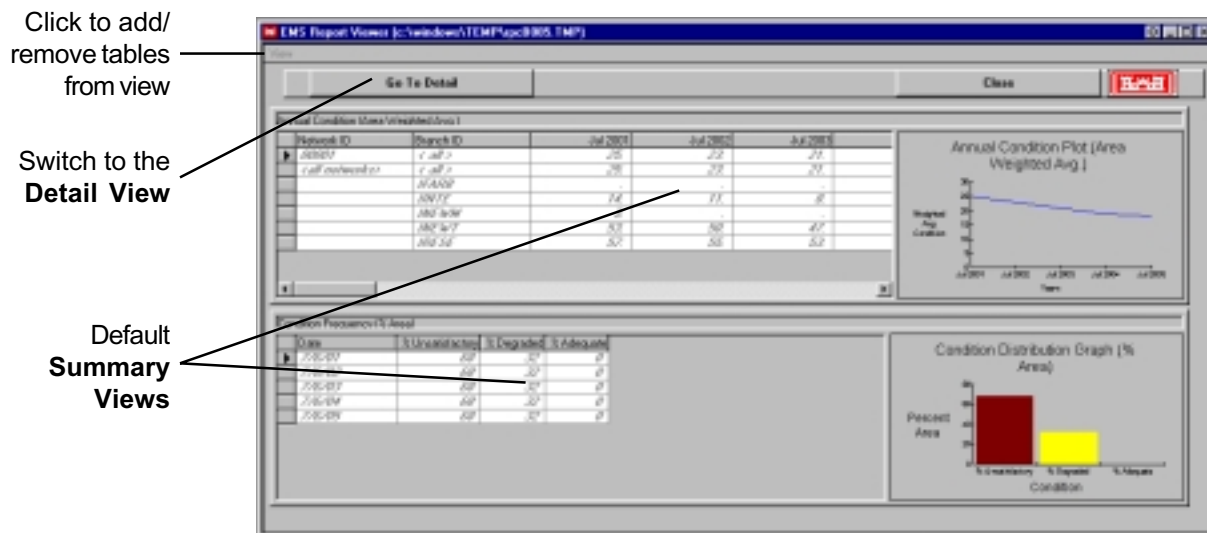
Other Views

The detail version of the **Condition Analysis** report default presentation includes the **Section Condition** table and its associated graph as well as the **Inventory Items** table. The **Section Condition** table is linked (as the dependent table) to the **Inventory Items** table (parent table).

A powerful feature of the **Condition Analysis Report** is demonstrated by selecting the **Inventory Items** table and then stepping down the **Inventory Items** table slowly one row at a time. Each row in the **Inventory Items** table represents one section in your pavement network. As you change the highlighted row in the **Inventory Items** table, the **Section Condition** table updates with historical, interpolated historical, and projected condition values for that section. Each time the **Section Condition** table is updated, the graph associated with the table replots the graphical view of the section condition. With this powerful tool you can quickly analyze the history and predicted condition of your network section by section.

The detail version also allows you to overlay the **Section Condition** plot with family curve and/or the **Work History** plot. These features are turned on and off with under **View > Detail** in the **EMS Report Viewer** window. Overlaying a family curve shows how the current view is performing in comparison to a particular family model. Overlaying a work plan shows the difference between the predicted decline of a pavement (or set of pavements), and the effects your work plan scenario. The **Section Work History** view (also linked to **Inventory Items**) produces a list of all information in the work

history table - by section. Similarly, the **Inventory Work History** view displays ALL work history records for every item in the current database. The **Section Condition List** is a representation of the condition plot - for each section - for the term of the condition analysis. Highlighting a record in the table causes the graph to respond, displaying the condition information for that section only. To see an average for all sections included in the report, go back to the summary views.

In addition to the **EMS Report Viewer**, the **Condition Analysis Report** also opens a "Select GIS Views" window. This window contains a preset view linked to the results of the current Condition Analysis report. The name of the view is "Section Conditions by Year" and can be viewed by double clicking on the GIS tree selector in this window. The resulting display is a year-by-year view of the conditions of each section included in the condition analysis. This GIS view is an excellent tool to quickly show the difference in condition from year to year.

Click to add/remove tables from view

Switch to the **Summary View**

Highlighted **Section** and Corresponding **Condition Plot**
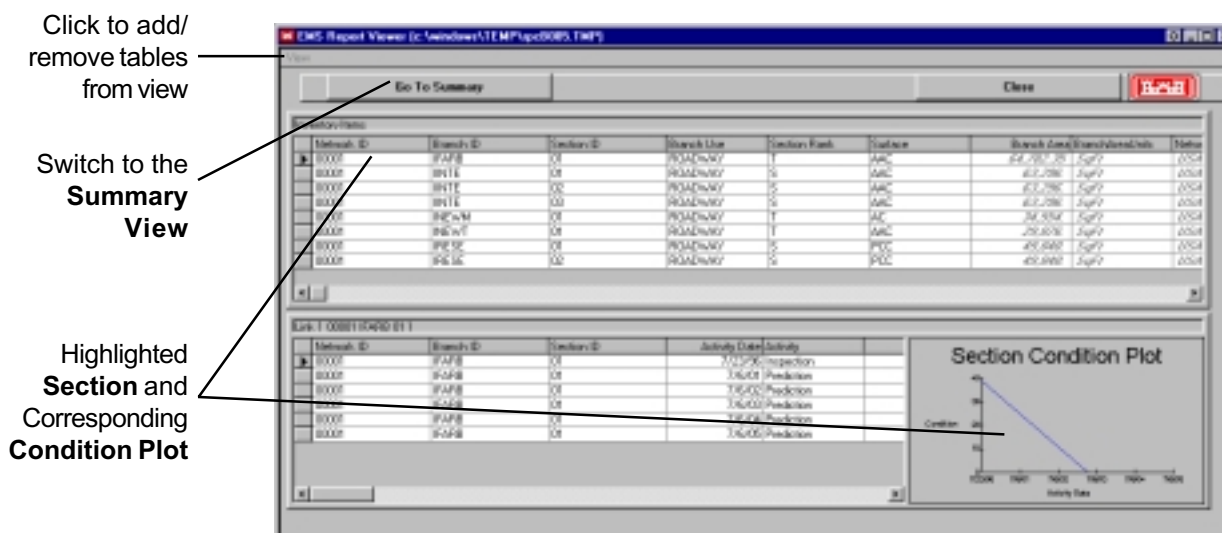
Open Saved Report

If desired, a previously saved report can also be viewed without "rerunning" (i.e. without PAVER recalculating and searching the database for changes). This can save considerable time for long reports. Selecting the **Open Saved Report** option opens the Windows file search tool that looks specifically for any file with the ".RPC" extension. Highlighting an RPC file and choosing **Open** brings up the **Condition Analysis** report and you can work with it as you would any other **Condition Analysis** report.
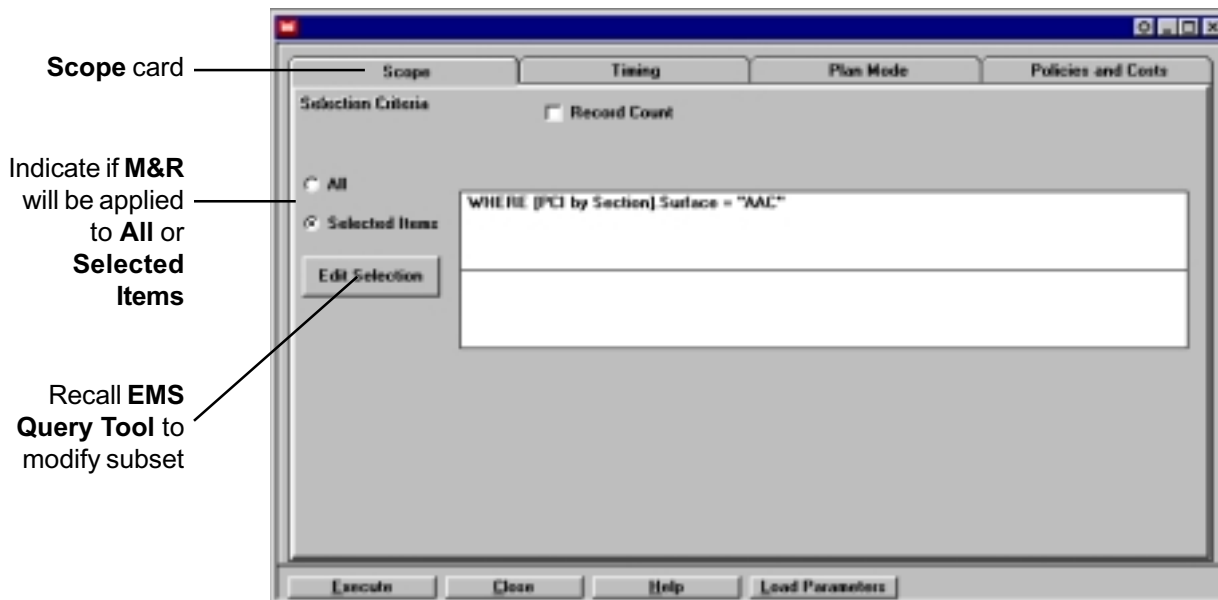
M&R

M&R Plan

Configuring the M&R Report

The PAVER **Work Plan** is a tool for planning, scheduling, budgeting and analyzing alternative pavement maintenance and repair (M&R) activities. The M&R plan utilizes basic inventory data combined with inspection information, maintenance policies, maintenance costs, and predictions about future pavement condition. **Work Plan** results are specific to your site. All factors used in determining future M&R or construction activity or the associated costs can be configured to reflect your pavement management practices and costs.

The **Work Plan** report operates like the **Condition Analysis** report. When you start the report, a four tab parameter collection window appears on the screen. When the **Work Plan** report is configured, you execute the report and view the results in the **Report Viewer**.

Tab 1 - Scope

The **Work Plan** parameters are configured through the **M&R Plan** module on the PAVER button bar. The **Work Plan** configuration window uses an index card style form with the **Scope** card appearing first. The **Work Plan** report can be applied to all the sections in your database or you may specify a subset of records. To analyze all sections in your database, use your mouse to select **All**. To analyze a subset of your pavement sections, click on **Selected Items**. The **EMS Query Tool** is launched immediately for you to indicate the subset of pavements that you would like to use. When you specify the **Selected Items** option, a new button, **Edit Selection**, appears on the **Scope** card. If you wish to edit your selection later, clicking this button invokes the **EMS Query Tool** for you to update your selection. As always, the **Record Count** check box shows the current section count based on the specific query you are working with.

Scope card

Indicate if **M&R** will be applied to **All** or **Selected Items**

Recall **EMS Query Tool** to modify subset

Tab 2 - Timing

The Timing card is used to specify the start date and number of years the plan will encompass. Entering the **Start Year** for the **Work Plan** and the number of **Years** to analyze specifies report duration. The **Start Year** field must be entered in mm/dd/yyyy format. **Years** is simply a numeric value with 1 as the minimum.

Tab 3 - Plan Mode

Three variations of the **Work Plan** can be used. The first, **Critical PCI Method**, optimizes M&R activity against a specified budget or determines the budget needed to maintain a specified condition level. The second, **Minimum Condition**, measures costs but rations M&R by pavement condition. The third, **Consequence Model**, measures the impact of a localized M&R action over the first year.

To select **Critical PCI Method**, highlight its radio button. Next, select the policies you wish to use in the work plan. The **Localized < Critical** option is used to indicate the use of **Safety M&R** policies. The **Localized < Critical** is used to indicate the use of **Preventative M&R** policies.

Below the maintenance policies are the **Determine Budget Consequence** option and the **Determine Budget Requirements** (Iteration) option. Selecting **Determine Budget Consequence** optimizes M&R activity against a specific budget. The dropdown box next to **Budget** is used to is used to specify one of the PAVER M&R budget tables to use with the report. The **Edit** button is used for reviewing and editing the selected budget table or for creating a new table. **Major M&R Priority** lets you set the hierarchy for determining which pavement type and which condition range gets repaired first. To edit or add a new priority table, select the **Edit** button. See **System Tables** for further instructions on creating or editing **Budget** or **Major M&R Priority** tables.

Selecting **Determine Budget Requirements** (Iteration) allows you to choose between **Backlog elimination** in *x* **years** or **Condition Stabilization**. Note that *x* changes as the work plan duration is changed in the **Timing** tab in **Backlog elimination in *x* years**. When **Condition Stabilization** is chosen, two more options appear. You must specify either **Maintain Current Area Weighted PCI** or **Reach Preferred Area Weighted PCI**. Finally, specify the maximum number of iterations that PAVER uses to calculate the goal.

The **Minimum Condition** option lets you set the lowest pavement condition (PCI) that is allowed for each pavement rank (**P** - Primary, **S** - Secondary, **T** - Tertiary, etc.). To edit or add a new **Minimum Condition** table, see **System Tables**.

The **Consequence Model** calculates the cost and resulting condition of immediate implementation of local M&R for the year of the most recent inspection. Note that choosing **Consequence Model** changes the work plan duration in the **Timing tab** to one year automatically.

Select desired M&R policies

Select budget options

Select **Budget** and **Priority** tables

Minimum Condition option

Select and Edit **Minimum Condition** tables

Tab 4 - Policies and Costs

Work Plan maintenance policies and work costs are configured on the **Policies and Costs** card. Notice that if the maintenance policies below **Critical PCI Method** were chosen on the Plan Mode tab, the same policies are active on this tab.

The drop-down boxes, positioned by the **Localized** repair options, are used to select the maintenance policy to apply for **Policy < Critical** and **Policy > Critical M&R**. Associated with each maintenance policy is a cost table. You may accept the default selection or specify a custom cost table. The maintenance policies and cost tables are defined in data tables that can be created or edited by clicking on the **Edit** button that corresponds to the table you are working with, or through the **Tables** selection on the PAVER Menu.

Different global maintenance work types can be specified for minimal, climate related, and skid causing types of distresses. The pick lists associated with the three global maintenance labels show the available global repair options and the **Interval** (policy application interval), **Delta** (improvement in the condition as measured by years until condition returns to the current state), and **Cost** (per unit of pavement) associated with each repair option. You may select "none" from the list if you do not wish to perform one or more of the three types of global maintenance.

To edit the global maintenance lists, again click on the corresponding **Edit** button or choose **Tables>M&R Plan Tables>Global M&R** from the PAVER Menu. PAVER will display the information to be edited using the **Tab Table** editor. There are two tables of information used to describe global M&R work. These two tables are **Work Types** and **Cost**. To change existing work type description information, simply click on the work type information field desired, and enter the new information. Similarly, to change existing cost information, select the tab for **Cost**, then select the desired **Cost** table using the drop-down box at the top of the **Cost** card, and edit the information directly on the grid. Several different **Cost** tables may be used in PAVER, even for the same work items. This is because costs may vary depending on whether they are done in-house or by contract, as part of a small job or part of a very large one, for example.

To add new **Global M&R** table information, you must first understand the relationship between the tables used for **Global M&R** work. The **Work Types** card is the master table. In order for cost information to be entered, there must first be a **Work Type** entry. **Cost** information can be entered for any of the work types in the **Work Types** table. Often, cost information will be added only for those work types which you expect to use in your **Work Plan**. When you choose to add a record in the **Cost** table, you are asked to choose an existing work type from a list of **Work Types** already defined. Therefore, if you add a new work type description to the **Work Types** table and then go to the **Cost** table and choose to add a new cost item (using the **Add** button), you will see that your new work type is now on the list of **Work Types** available to add cost information.

In addition to adding work type descriptions to the **Work Types** table, and cost information to an existing **Cost** table, you may also create new named **Cost** tables using the **Add Table** button on the **Cost** card. When you first create a new **Cost** table, it will be empty, without any information on any work types. Use the **Add** button on the **Cost** card to create new records (i.e. rows of cost information) for any work types you desire in your new **Cost** table.

Major M&R is performed on sections, which have structural distresses at the time of the last inspection. Major M&R is generally only performed on sections with a PCI below the critical PCI or sections that will fail prematurely due to design or construction deficiencies. A different start date option is provided for Major M&R to accommodate design preparation or seasonal delays.

The cost of Major M&R is determined by the PCI at the time the work is performed. The Cost by Condition table specifies the cost of various categories of repair, including Major M&R. To Edit the Cost by Condition tables select **Tables>M&R Plan Tables>Major M&R** from the PAVER Menu. Select the **Cost by Condition** tab from the **Major M&R** table to set the per unit cost of Major M&R. The **Cost by Condition** table used in the **Work Plan** is specified at the top of the **Maint. Policies** card on the **Work Plan** form in the **M&R Plan**.

There is an option to **Apply Policies in the First Year**. You may check this box if you would like the localized policies to be utilized in the first year of the M&R plan. Otherwise, in year two and beyond, the **M&R Cost by Condition** table selected will determine localized policies. Also, there is an option at the top of the card to apply an inflation rate. Check this box and input the desired rate.

Once the **Work Plan** has been configured, clicking the **Execute** button located on the bottom of the **Work Plan** configuration form launches the process.

Select Localized M&R policies and costs

Select Global M&R policies and costs

Select Start Year for Major M&R

Analyzing M&R Activity

Once you have configured the **Work Plan** report, click the **Execute** button to start calculating the report. When the report calculations are completed, the **Work Plan** report is presented in the **Report Viewer** tool. The default presentation of the report is a summary of the **Work Plan** that includes two tables with corresponding graphs. The summary view includes the **Condition Distribution Graph** (No. of Sections), that shows a breakdown of the number of sections in each condition category - for each year of the report. **The Condition Table** is accompanied by a graph that plots the conditions over time. The other default table/graph is the **Total Funded** table. This shows the totals of funds spent for each year of the plan - broken down by work category (e.g. Localized, Global, etc.). **Additional Summary Work Plan** tables are the **Summary Table** and the **Applied Policy Summary Table**.

Click to add/
remove tables
from **View**

Switch to the
Detail View

Default
**Summary
Views**
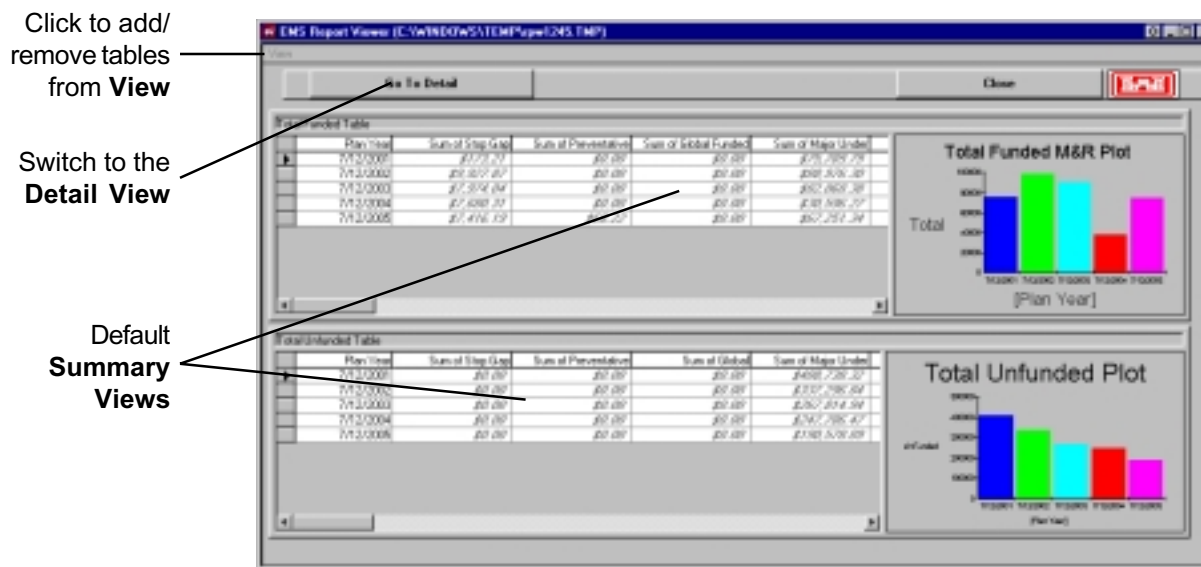
Summary View Section

The **View** menu on the PAVER Menu is used to add or remove tables and their associated graphs from the report viewer screen or to switch between the **Summary** and the **Detail** version of the report. To turn off one of the **Summary** tables and their associated graphs, select **View>Summary** from the PAVER Menu, and then select the table that you want to turn off. Tables or graphs which are active in the current report view have a check mark to the left of the table or graph's name. Other summary views include:

• **Annual Condition After Repair** - This displays the condition of each branch-and the entire network (or networks if you have more than one) AFTER the recommended work has been performed.

• **Condition Table** - This view shows a "before and after" average condition of all sections included in the current plan and for each year of the plan.

• **Total Funded / Total Unfunded** - These tables show how much money was spent (**Funded**) and how much PAVER wanted to spend, but did not have the funds (**Unfunded**). Unfunded work is also referred to as "Backlog".

• **Summary by Section** - This view shows a combination of things seen in other views, the condition of each section before and after work is performed, the type of work needed, and the cost involved.

• **Applied Policy Summary** - This is a breakdown, in summary form, of each **Maintenance Policy**, corresponding work description, and associated work quantities, and costs.

Detail View Section

Note

Data shown in the **Summary View** is branch level data while data shown in the **Detail View** is section level data.

The **Detail** (**View>Detail**) version of the **Work Plan** includes the **Detail** table, **Applied Policy Details** table, **Inventory Items** table, **Missing Values** table, and a table listing the parameter settings used in the report. If the **Consequence Model** was requested, an additional table titled **Applied Policy Consequences** is included in the **Detail** report. Some table definitions include the following:

• **Detail Table** - A breakdown - by section - of the amount of money spent in each work category, and before and after conditions.

• **Policy Action Details** - A list of distresses encountered (from the last inspection date for each section) and work applied.

• **Detail Table by Section** - This is the Same as **Detail Table**, but it includes an associated graph displaying condition.

As with the **Condition Analysis Report**, the **M&R Report** also produces a "Select GIS Views" window that allows you to view three separate, preset GIS views associated with the current M&R Report. The preset views are:

• **"After" condition by Year** - This shows the condition of each section in the report "after" the funding (work) has been applied to that section.

• **All planned M&R by year** - show a breakdown - by year - of what types of work need to be done (according to the M&R plan) on each section.

• **Major Planned M&R by year** - same as above, concentrating only on the Major M&R work. Split into two categories: Above Critical (for sections above the critical PCI) and Below Critical (for sections below critical).

Reminder: GIS views are only available if you have linked a coverage to your database (See the chapter on GIS).

Click to add/
remove tables
from view

Switch to the
**Summary
View**

Highlighted
Section and
Corresponding
Condition Plot
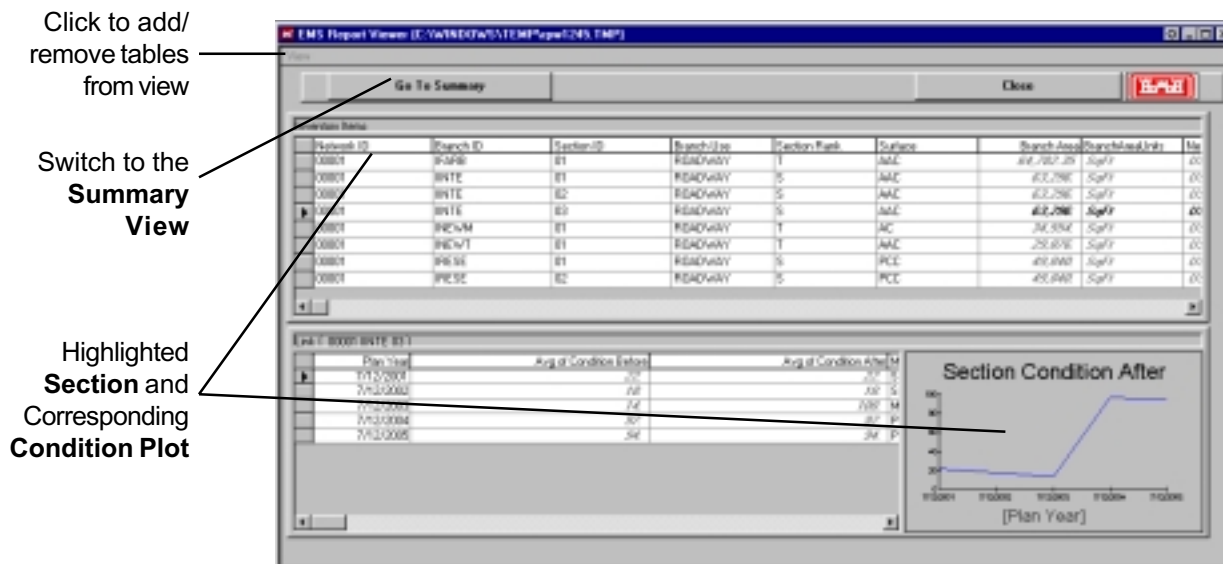
Open Saved Report

As with the **Condition Analysis** reports, you can also save any M & R plan that you
run. Again, a primary advantage of doing this is saving the time it takes to execute the
report. Depending on the speed of the computer and the parameters of the report and
the size of the database, this could be significant. It also provides an easy quick way to
compare different reports.

Add-Ins

PAVERGIS Interface

GIS Overview

The PAVERGIS program provides Geographical Information Systems (GIS) capabilities for viewing and presenting pavement inspection and work plan information available to PAVER users. The PAVERGIS program assists in the setup and maintenance of your PAVER data in a format compatible with Environmental Systems Research Institute's (ESRI) ArcView software. The first part of this chapter briefly introduces some of the CAD/GIS concepts used to setup pavements for use in a GIS environment. The remainder of the chapter details the installation procedure for the PAVERGIS software as well as the functionality of the software once a GIS coverage has been properly created.

Distinctions between CAD and GIS

There is a distinction between traditional Computer Aided Design (CAD) software and Geographic Information Systems (GIS) terminology. CAD describes entities as lines, circles, ellipses, arcs, and points. Layers are used to differentiate between functional, physical, and location differences of entities. In GIS terminology, arcs are used to describe all linear entities, whether they are lines, circles, etc. Points are still points, but an additional entity, called a polygon, describes a series of entities that completely enclose any geometric shape. Collectively, polygons, arcs, and points make up the three distinct feature classes. Coverages are analogous to Layers. However, only one type of feature is typically present in a single coverage. Coverages may contain polygon and arc features, or arc and point features, but not polygon and point features.

Polygon and Arc Attribute Tables

The two features that can be used to represent pavements are polygons and arcs. If polygons are used to describe the sections in a PAVER database, then a Polygon Attribute Table (PAT) is created as part of the coverage. If arc segments represent the sections, then an Arc Attribute Table (AAT) is created as part of the coverage. A coverage is defined by several files (PAT, AAT, etc.). Some of the files contain graphical information, and others contain table information. Our discussion focuses on PATs. AAT users can substitute AAT for PAT in the text. The section on polygon closure is not be applicable for AAT users.

Software Context

The material presented here assumes one of the following CAD/GIS software tool environments are used:

AutoCAD + ArcCAD = Coverage for ArcView

Intergraph + DGNARC = Coverage for ArcView

PC ArcInfo = Coverage for ArcView

Acquiring Computer-Based Graphical Representations

The most clean GIS maps are created by graphically inputting the pavement network system data directly into a GIS environment. This approach eliminates many potential problems, which is discussed later. However, it is not always possible to enter data directly into a GIS environment. The following discussion is geared towards those operators who obtain their graphical display on AutoCAD either by scanning maps, scanning aerial photographs, or manual digitization of maps. You may be able to get an electronic information transfer from other agencies such as the state, United States Geological Survey (USGS), or utility companies. Look into these possibilities before spending money on work that may have already been done.

Manual Digitization of Preexisting Drawings

Manual digitization has the advantage of continuity of line segments; that is, each line starts at the exact endpoint of the previous line segment and ends at the exact beginning of the next line segment. This is an important concept when we discuss GIS systems. However, manual digitization is very time consuming and may be impractical for some users with limited time resources. If this method is chosen, it is important to close all polygon sections and create layers relevant to the project.

Scanning Maps or Aerial Photography

Scanning is faster for inputting graphical data. However, some errors may be introduced in the automated digitization process, such as dangling line segments (lines which look continuous but have small under or overshoots) and random error from "noise" introduced by the scanning medium - the device or the pictorial representation being scanned. Once scanned, the map must be edited to assure that the lines are connected, polygons are closed, section lines are added, and appropriate features are placed on respective layers.

Aerial photography has the potential to be the most accurate but is by far the most expensive. One possible solution to this is to have aerial photographs taken with a group of other interested parties. This spreads the cost of the project between members of the group and each member still derives the same utility as if they had contracted out alone.

Modifications to Geographical Representations

Once you have your graphical representation in a CAD environment, you will want to look at how to order your information. It is be important to place like features on the same layer, using different layers for different types of topographical information or items. For example, place all the Parking Lots on a Layer called *parklots*, and all the buildings on a layer called *buildings*. If the number of buildings is large, then you may want to break the buildings up by type, I.E. Residential housing as *builders* layer, Administrative buildings as *buildadmin*, etc. Place the streets and avenues on the *streets* layer.

After you have your graphics display modified to deal with the different layers, you will want to "Turn Off" and "Freeze" all layers except those that contain items in your PAVER database, I.E. streets, parking lots, access ways, airfields, helipads, and pavements in general. Now create a new layer called *section* and make it the current layer. This is the layer on which you draw lines to enclose your sections as defined by your PAVER database. Use a combination of the existing lines on your streets, parking, and other pavement layers to define your polygon representation of sections. It is permissible to use lines from more than one layer to define a GIS polygon.

It is critical that each and every section be an enclosed polygon unto itself. You will want to systematically go through your PAVER database and graphically display each section on the computer, viewing the starting point, any features within the section, and where the section ends. This allows you to see where sections are and add section lines where needed. The following figures illustrate the addition of section lines:

In Figure 1., we consider the section of Boulder Ave. from the east side of the Boulder/ Ace intersection to the south side of the Boulder/Crandall intersection. To define this polygon correctly, we need to close it off from other streets. In Figure 2., we show with bold lines the appropriate places to augment the topographical lines with section lines to correctly define the polygon representing this section of Boulder.
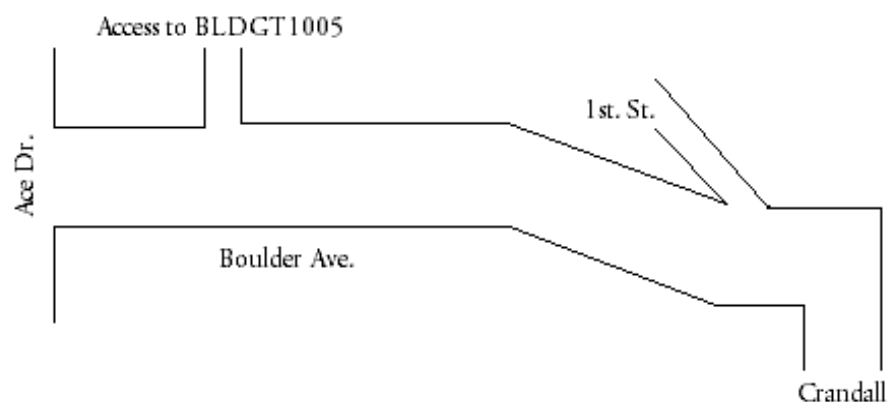
Figure 1.

You will not use bold lines in practice, but since we have chosen not to use different color lines, the bold lines represent lines on a different layer. This section of Boulder is now in correct GIS format (closed polygon). The regular lines represent topographical information, and the bold lines represent artificial information we added to aid in the definition of our PAVER generated Network/Branch/Sections.
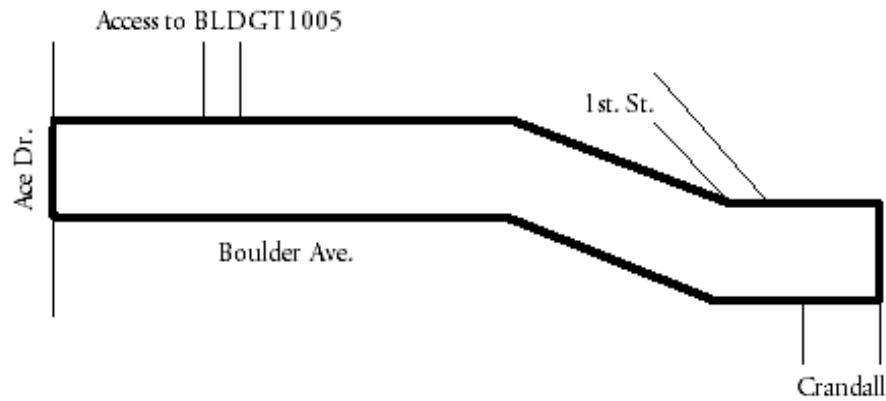
Figure 2.

We can take this a step further, as shown in Figure 3., and say that you desire to break this portion of Boulder into two sections. The first section starts at the East side of the intersection of Boulder/Ace, runs to the West side of the intersection of Boulder/1st, and runs to the south side of the intersection of Boulder/Crandall. We need to add one section line at the West side of the intersection at Boulder/1st:
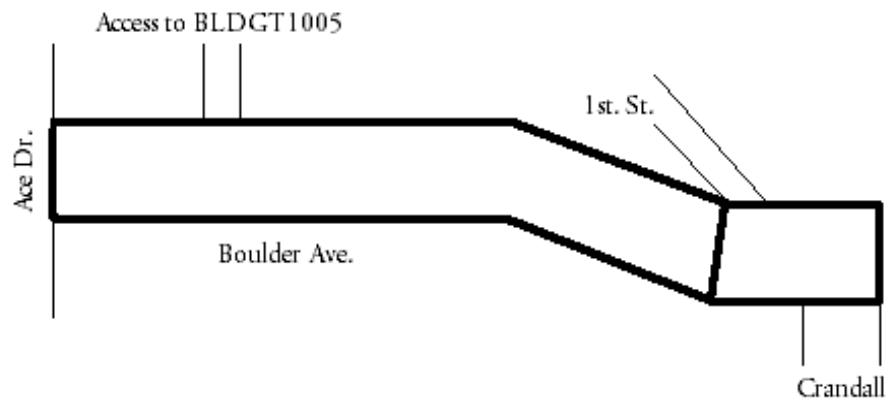
Figure 3.

The concept of subsections is important. For example, all driveways on Brown St. in a residential area may be treated as a single PAVER section even though they are noncontinuous. Subsections are parts of a section; the sum of all the subsections taken together comprise the whole section. They all have the same Network/Branch/Section ID number, and are represented by many polygons.

Build and Clean Operations for Digital Data

Once your polygons are closed you can create your coverage and assign label IDs for each polygon. AutoCAD users can discover polygon errors by using ArcCAD's Clean command. The Clean command creates the coverage and flag closure errors. Closure errors are locations in which a dangling line exists. Errors are indicated by small red boxes. Repair the closure errors in AutoCAD and create a new coverage. Ensure that you write down where you save the pavement coverage. The coverage file does not have an extension, and does not show up in the File Manager or Explorer. Intergraph users create a coverage using DGNARC2, manually review the coverage for errors, return to Intergraph to make repairs, and then create the coverage again. ArcInfo is a complete drawing editor with plotting tools, topology creation, and maintenance capabilities to create the coverage. If you do not have ArcInfo, a GIS viewer such as ArcView or MapInfo can be used. If you are using ArcView, open the new coverage and select Theme…Auto-label. This displays the polygon ID numbers for each polygon in the coverage. We recommend printing your coverage with the polygon label IDs. This map then helps you to perform the **Construct PAVERGIS link table** procedure described in the Setup operations section of the manual.

PAVERGIS Usage

PAVERGIS is the primary interface tool between PAVER and GIS. It converts a PAVER database to a dBase file and provides the means to link PAVER IDs (PID) with the coverage polygon numbers. To start the PAVERGIS Interface, click the **PAVERGIS** button on the PAVER button bar. This starts the PAVERGIS program and open the PAVERGIS desktop. The PAVERGIS Menu provides the following items/functions: **Update**, **Database**, **Prediction**, **Setup**, **Options**, and **Window**.

First-Time PAVERGIS Setup Summary

1. Select **Setup** from the main PAVERGIS menu.

2. Select the **Available Data Sources (PAVER & GIS)** option and specify the available PAVER and coverage files.

3. Select the **Prepare data** option. This feature now encompasses several operations that were separate in previous versions of Micro PAVER. The following operations are completed in a simplified format on one screen in the new PAVERGIS:

    • Exporting the PAVER data to dBase format.

    • Creating fields in your GIS coverage to match the fields from the PAVER database.

    • Export PAVER work plan or condition history reports to GIS.

- Match up the GIS map depicting pavement features with the PAVER defined pavement sections.

- Copy PAVER PIDs to the PAT/AAT file.

- Copy PAVER database information to PAT/AAT files.

- Enter ArcView and view data.

Steps for Initial Setup

Available Data Sources (PAVER & GIS)

Use this option to make PAVER database and GIS coverage information available for use with the PAVERGIS program. The PAVERGIS program can not operate until you specify the location for source files. This editor allows you to specify the location of your PAVER 4.x and 5.0 databases and GIS coverages.

To add a PAVER database to the list:

Click the **Add** button next to the PAVER Data table. Find your database. You may have to change the drive by using the **Drives** drop list. You may have to move to another directory. When your file name appears in the **File Name** box, highlight the file and click the **OK** button. Enter the **Description** for the database and click **OK**.

To place GIS coverage Data on-line:

1. Click the **Add** button next to the coverage Data table.

2. Locate the corresponding coverage database in the GIS directory and click **OK**. Be certain that you highlight the PAT.DBF file before clicking the **OK** button on the **File Dialog** form. Problems have been observed if the full path and file are not specified.

3. Enter the **ID** for the coverage and press Enter.

4. Enter a **Description** for the coverage and press Enter.

5. Click the **Next** button to continue.

Available Data Sources screen

Click **Add** to add a PAVER database or GIS coverage to you list of available data

Click **Next** to move to the next screen and prepare the available data for GIS viewing
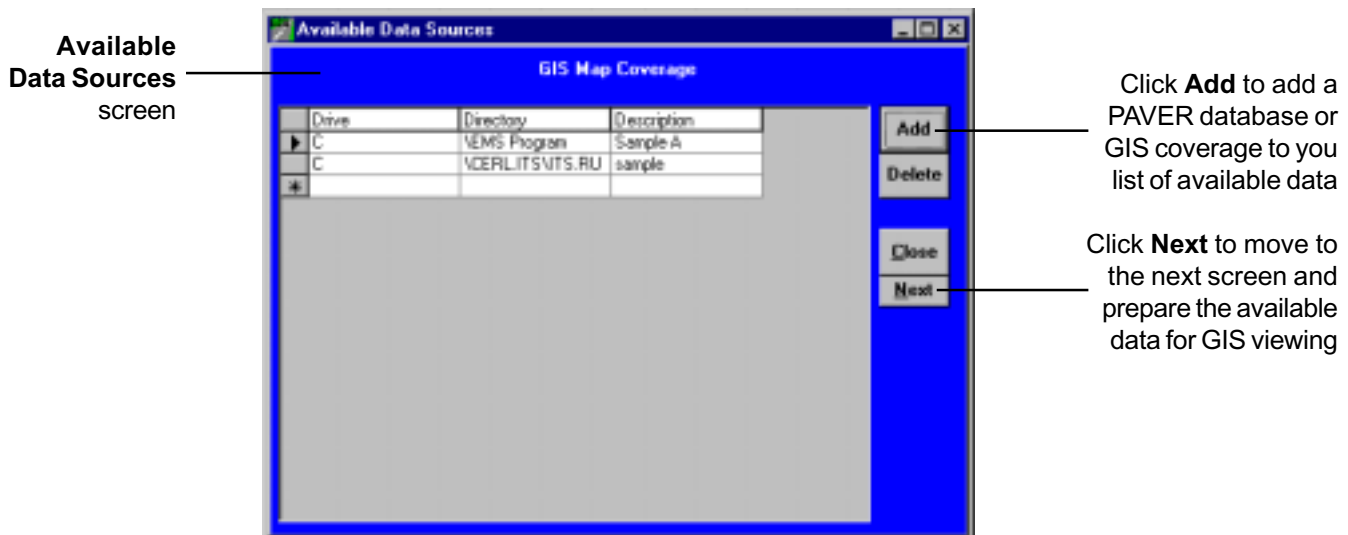
Preparation of Data

This screen is the condensed process by which the PAVER data and GIS coverage information is linked. The first step is to extract PAVER data from the PAVER data structures.

1. It is important to identify any Work Plan or Condition History reports from PAVER that you wish to view in the GIS. Check the box next to the report you wish to export. Click the **Select** button and browse for the report file.

2. The second step is to identify the appropriate GIS coverage by selecting it from the drop list.

3. The next stage is the construction of the link table between the Pavement ID's and the Polygon ID's. Click the **Load PID** button to place the Pavement ID's from the exported database into the link table.

4. The next step is to input the corresponding Polygon ID number for each Pavement Section. You can either open the coverage in a viewer or print out the coverage with the polygon ID numbers on it. In some cases, there may be several polygons contained within a single PAVER section. In that case, you can use the **Add** or **Delete** buttons to create duplicate sections and input all of the corresponding polygon numbers. NOTE: Only one polygon number should be inputted on a line.

Prepare Data screen

Select saved Work Plan or Condition History reports to be viewed in GIS

Input the polygon numbers from the coverage with the corresponding pavement ID numbers

Export the pavement data to the PAT/AAT table for GIS viewing

5. The final step is to Update the PAT/AAT from the exported database. This is the process of moving the pavement database information into the PAT/AAT tables using the previously created link. Just click **Update PAT/AAT from Export** to complete the operation. The **Initialize** box is selected by default. This means that all of the information in the PAT/AAT are overwritten. If you had previously created a work plan report for the coverage and viewed it, but returned and created a condition history report without changing the database, then you could uncheck the **Initialize** box.

Updating Data

This option is used to reflect PAVER data changes in GIS. If your PAVER databases have changed due to inspections, work planning, or construction activity, the PAVERGIS options let you quickly update your GIS databases.

Exporting PAVER Data (Access/Rbase to dBase)

This option invokes the program that extracts data from the PAVER data structures.

1. Select the radio button that corresponds to the PAVER data format for the database you wish to use. Select a database to export from the drop list. The default is the first database.

2. Click on the **Start** button. NOTE: If the **Start** Button is not available, the program cannot find a database to export.

3. Click on the **Quit** button when the process is complete.

Copying PAVER dBase Data to PAT/AAT

This option copies your PAVER database information to PAT/AAT files.

1. Select PAVER Data and coverage databases from the drop lists. Both default to the first databases in the list. If a change is required, click on the down arrow and select the desired database from the list.

2. Click the **Start** button.

3. Click the **Print** button to send the list to the default printer if required.

4. Click the **Quit** button.

Database Editors and Reporting Options

Tools to edit databases, maps, exported PAVER databases, and link tables.

Edit PAVER dBase format table: This editor enables the editing or printing of information extracted from PAVER.

1. Use the drop list to select a database.

2. Click the **Open** button.

3. Click on a box in the table to edit or right click and select from the **Fields Shown/ Hidden** on the table.

4. Click the **Print** button to send the list to the default printer.

5. Select the **Quit** button when editing is complete.

Edit PAT/AAT file: This editor enables the editing or printing of information contained in the GIS database following the update from PAVER Exported data. You can use this editor to alter information stored for a segment. This information is directly accessed by the GIS map programs. The changes made in pavement data is over written when you "Copy PAVER dBase data to PAT/AAT."

1. Use the drop list to select a coverage.

2. Click the **Open** button.

3. Click on any of the boxes to edit and correct the data.

4. Click the **Print** button to send the list to the default printer.

5. Click the **Quit** button to exit.

Note: All PAVERGIS tables may be customized by clicking the right mouse button while the table is highlighted, for more information, see the "Right Button Click on Tables" section. In addition to changes available through Browse Properties, columns may be re-sized or dragged to change their order, directly on the table.

Rebuild PAVERGIS link table: This option is used to rebuild the GIS link table when the Attribute PAT/AAT table (selected from the Options menu) has been previously populated. This typically occurs when you add a new section or break an existing section into multiple sections.

1. Select a Map ID using the drop list box.

2. Click on the **Go** button to rebuild the link table.

3. Click on the **Quit** button to exit.

Edit PAVER dBase File screen

Edit PAT/AAT File screen
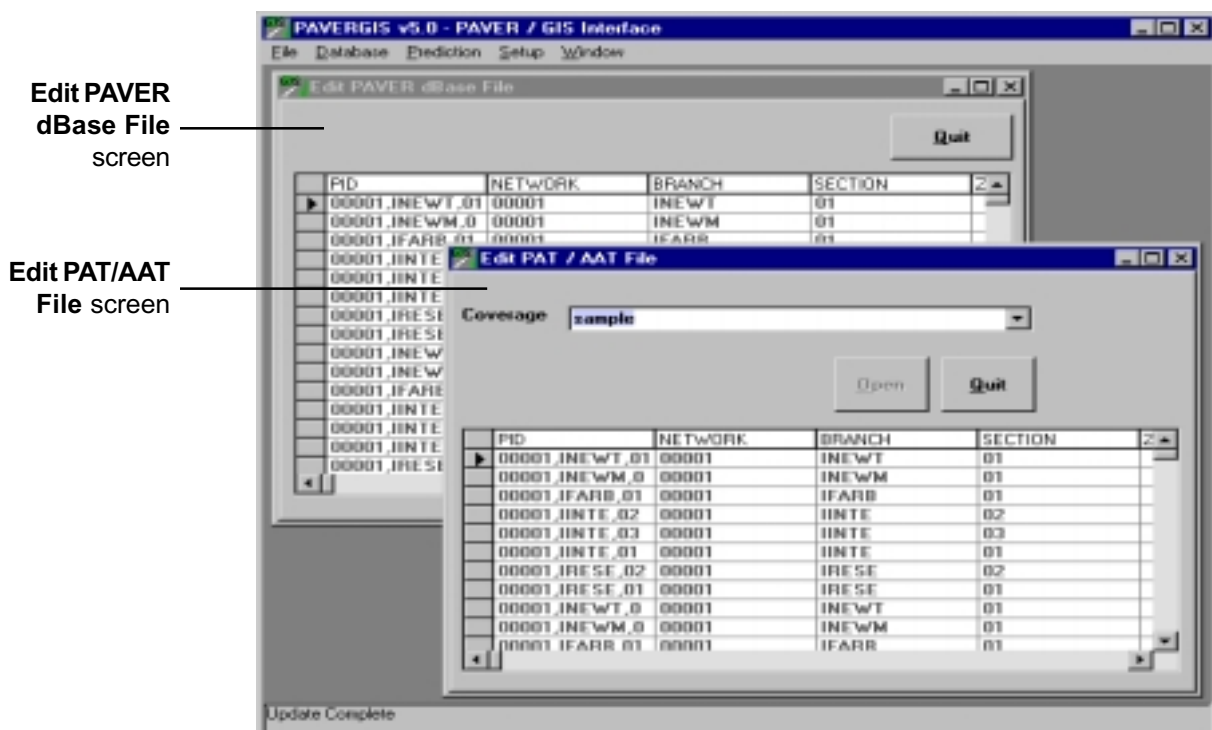
Options for Viewing Windows

Cascade: This option arranges any open windows in the application so that they overlap each other with only the title bar of each window visible.

Tile Horizontal: This option arranges any open windows in the application so that no window overlaps another. All windows are visible and stacked from the top to the bottom on the screen.

Tile Vertical: This option arranges any open windows in the application so that no window overlaps another. All windows are visible and stacked from left to right on the screen.

Arrange Icons: This option automatically arranges the icons.

Exiting PAVERGIS

Exit PAVERGIS: This option takes the PAVERGIS user out of the application and closes the Interface window.

About PAVERGIS: This option provides the PAVERGIS user with information on the application.

Condition Data Import (ASCII)

The **Condition Data Import (ASCII)** feature allows you to import data into PAVER using ASCII file format. Upon launching the feature, a file wizard is opened to help guide PAVER towards the appropriate data files. For examples of how to format files for ASCII Video Inspection Import see **Appendix C-1.**

The ASCII Condition Data Import wizard helps guide PAVER to the correct files

Note

You can either use the wizard to locate the files, or locate the files one by one without the wizard.
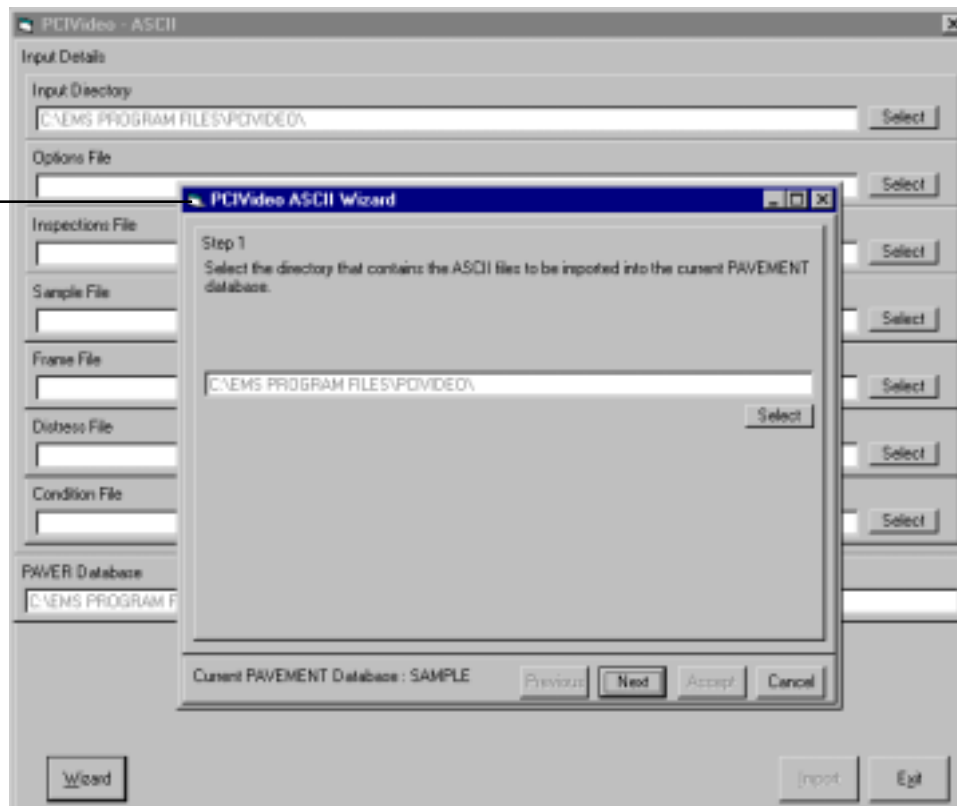
Condition Data Import (Database)

The **Condition Data Import (Database)** feature allows you to import data into PAVER using .mdb file format. Locate the database file that you wish to import by first selecting the **Inuput Directory** and then selecting the **Database Name**. For more information on video inspection import data format for Access Databases see **Appendix C-2.**

Select the
**Inuput Direc-
tory**

Select the
**Database
Name**
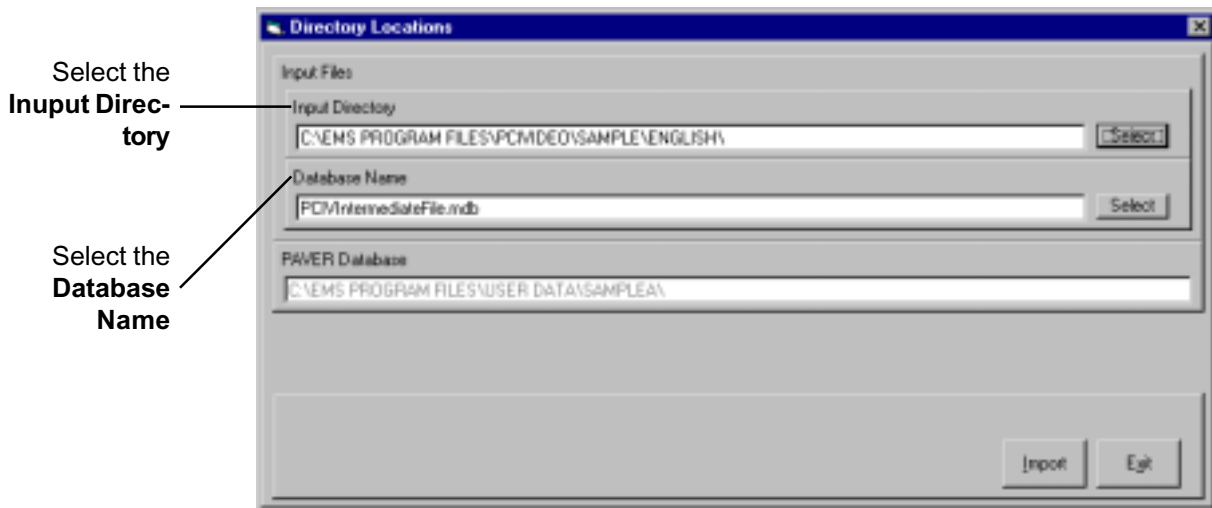
Handheld Data Import

Micro PAVER Inspection Data Entry Using a Windows CE Handheld Device

Hardware/Software Requirements

For the installation of the **Handheld PCI Inspector** program, a handheld device with the Windows CE operating system and Microsoft Pocket Access is required. In addition, Microsoft Active Sync must be installed on the computer (herein referred to as "main computer") that inspection information will be downloaded from and uploaded to. Additionally, PAVER must be installed on the main computer.

Software Installation

First, install Microsoft Active Sync on the main computer. Microsoft Active Sync is a free program that can be downloaded from www.microsoft.com. Second, link the handheld device to the main computer by connecting the two via serial port or USB port and launch Microsoft Active Sync. When prompted by Microsoft Active Sync to setup a partnership with this computer select "No".

Note: A partnership is used when the synchronizing of files on the handheld and PC are desired—this is not necessary for this Micro PAVER application.

To install the necessary software to the handheld device, select the install file from the handheld installation CD.

Basic Software Operation

Process Overview

In an effort to expedite the Pavement Condition Index (PCI) field inspection process, PAVER has the added capability of interacting with Windows CE, handheld devices. This capability was developed as an "add-in" to PAVER and currently ships with Micro PAVER 5.0.

Handheld Data Import is accessed in PAVER through the **Add-Ins** menu. Data for field inspections can be downloaded from Micro PAVER to a Windows CE, handheld device that has the **Handheld PCI Inspector** program installed.

Typically when preparing for a field inspection, the first step is to download the sections to be inspected to the Windows CE, handheld device. Data transfer between the main computer and the Windows CE device is facilitated with Microsoft Active Sync. With Microsoft Active Sync, sections to be inspected may be transferred from the main computer to the Windows CE, handheld device using the **Download Sections to Inspect** tab available through the Micro PAVER **Add-Ins** menu. Once the appropriate sections are transferred to the handheld device, the handheld device is ready for use in the field.

After the inspection has been completed, the data on the Windows CE, handheld device must be backed-up using the **Backup Inspection Data** tab that is accessed through the PAVER **Add-Ins** menu. The backed-up data may then immediately be imported into PAVER or imported at a later date. In order to import the data the third tab labeled **Import Backup Data into PAVER** is used. During the data import, all distress information is transferred to the appropriate Micro PAVER database on the main computer.

The **Handheld Data Import** option in the PAVER **Add-Ins** menu launches a window with three tabs that perform three different tasks. The first tab is used to **Download Sections to Inspect**. The second tab is used to **Backup Inspection Data** after an inspection has been performed. The third tab is **Import the Backup Data into PAVER**. If no device is detected by PAVER, you are only allowed to use the third tab to import previously backed data into PAVER.

Detailed Process

Download Sections to Inspect

When downloading sections to inspect, the user has available three methods to select the sections to download to the handheld device.

1. The first method is to **Use PAVER Selections**. This method allows the user to select the desired sections using any of the PAVER **Selectors** such as the **Tree Selector**. Sections selected using the **Tree Selector** are automatically placed in the download queue.

2. The second way to choose the sections to download is to **Use the Inspection Schedule**. This method allows the user to choose sections based upon their inspection schedule. Based on the Inspection Schedule selected, PAVER automatically selects the appropriate sections to inspect.

3. The final method to choose the sections to download is to **Use the Query Tool**. This method uses the PAVER **Query Tool** to search for all desired sections.

Current online database

Three methods for locating sections to be downloaded

List of sections selected for download

Note

When sections are downloaded to the handheld device, the data on the handheld device is overwritten. Make sure that all data is backed-up prior to downloading sections.

Once the desired sections are found using the second two methods, click the **Add Items** button to move the sections into the download queue. To remove a section from the queue, just highlight the row or rows to be removed and click the **Remove** button. As soon as all the desired sections are queued, click the **Transfer** button and the sections are downloaded into the handheld program. Note: This overwrites any inspection data that is on the handheld. ***Be sure that all data from the handheld has been backed up into Micro PAVER before transferring new data to the handheld.*** Fortunately, PAVER alerts the user if data that has not been backed up is about to be overwritten.

Inspections Using the Handheld PCI Inspector

After data has been transferred to the handheld device, field inspections may be carried out using the **Handheld PCI Inspector** program. The **Handheld PCI Inspector** program is separated into three tabs: **1. Sections**, **2. Samples/Frames**, and **3. Distresses**.

The **Sections** tab enables the user to view downloaded sections, add new sections to inspect or add comments. Downloaded and added sections appear in the large text box listed by network, branch, and section names. When adding a new section the user can edit network, branch and section names along with the use, surface, area, number of samples or frames, and age.

The **Samples/Frames** tab allows the user to edit or add specific samples/frames. Downloaded samples/frames appear in the large text box. Unlike the **Sections Tab**, you may delete or edit any downloaded samples/frames. In addition, a sample may be declared to have no distresses by clicking the **No Distress** checkbox.

The **Distresses** tab allows the user to enter the distresses for each inspected sample/frame. The current sections and samples/frames are indicated at the top of the screen, and may be switched by clicking the left or right arrows on either side of the section or sample/frame ID. In order to add a new distress, click **New**. The distress type then can be either picked from the list of distress types or entered into the text box. Distress severities are selected from the pull down menu (if applicable) and distress quantities may be entered directly. In order to save the entered distress data, use **Save**. If a sample has no distresses, click the **No Distresses** checkbox. When working with frames, if a new frame is desired click the **New Frame** button, and a new frame is added with the same attributes as the previous frame.

The following information pertains to all three tabs. When adding a new section, sample, or distress, the user must first click **New** and then click **Save** after editing the appropriate fields. The user must also remember to select **Save** after **Editing** existing sections, samples, or distresses. Data may be entered by using the keyboard, the number keypad, or handwriting recognition for all data entry text boxes. ***Make sure that the cursor is located in the box that you wish to enter data.*** When using the number keypad, highlighted text cannot be overwritten – the user must click the **C** button to clear the text prior to entering the data. Comments may be added to any distress, sample, section, or inspection by clicking on the **Comments** button and either writing or typing the comment in the box.

> **Note**
>
> For sections downloaded from PAVER, you are only allowed to edit the number of samples or change the evaluation method from samples to frames.

Note: When writing a comment, the user must first make sure that the cursor is located in the comment box by first tapping the comment box to make the cursor appear. Any added section, sample or distress may be deleted by clicking the **Del** button. Sections downloaded from Micro PAVER cannot be deleted. Finally, the user may calculate the PCI for a section by clicking the **Calc** button on any of the three tabs. In order to see a detailed calculation of the PCI and Structural PCI, the user may elect to see the details by clicking the **Details** checkbox before performing the calculation. The calculated PCI and Structural PCI can also be seen on the **Sections** tab after calculations have been done.

Backup Inspection Data

Once the inspection data has been collected using the handheld device, the user must **Backup the Inspection Data** using the second tab from the **Add-Ins** menu. After connecting the handheld device to the main computer using **Microsoft Active Sync** as before, go to the **Add-Ins** menu and select **Handheld Inspector**. Using the second tab, **Backup Inspection Data**, select the appropriate file to be backed-up. Once a name is selected, click **Backup** to create the backup file. The backed-up files are automatically placed in the following directory: EMS Program Files\User Data*Name of Current Open Database*\ PI-Backup Data\. Since the backup files are put in these locations it is important to be in the correct database when backing-up files and importing files from the handheld device.

List of previously backed up databases

Enter desired name for the backup file
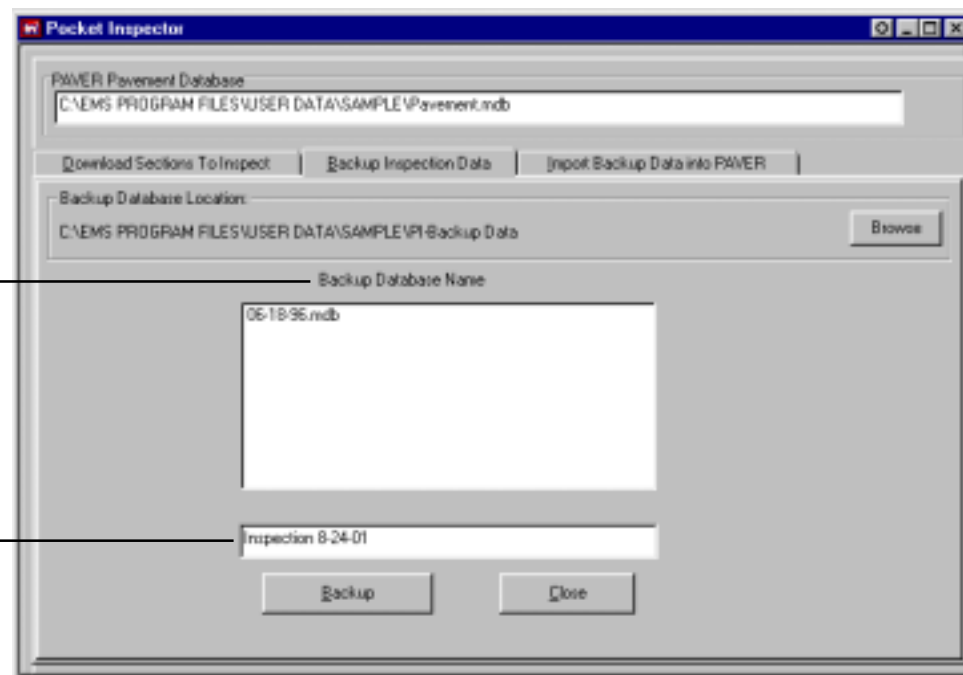
Import Backup Data into PAVER

After backup files have been created, the user may then **Import Backup Data into PAVER** by using the third tab on the Handheld Inspector menu. First select the backup file to import by hitting the **Select** button and choosing from the list.

Note: PAVER automatically places and selects files from a default location: EMS Program Files\User Data*Name of Database*\PI-Backup Data\.

After selecting the backup file, select the inspection date to apply to the data.

Note: If some sections were not inspected or a different inspection date is required for some sections, check the box next to the sections that should be skipped.

Finally, click **Transfer to PAVER** to transfer the files into PAVER. The transfer results indicate what sections where successfully imported and which ones were not.

Note: if a section has no inspection information, the information is not imported into PAVER for that inspection date.

If desired, the transfer results may be printed by clicking the **Print** button at the bottom of the tab.

<table>
<tr><td>**Hint**

When down-loading and importing data, make sure the correct PAVER database is online.</td></tr>
</table>

Locate the backup file to import

Select the appropriate inspection date to apply to the sections

Results of inspection data import
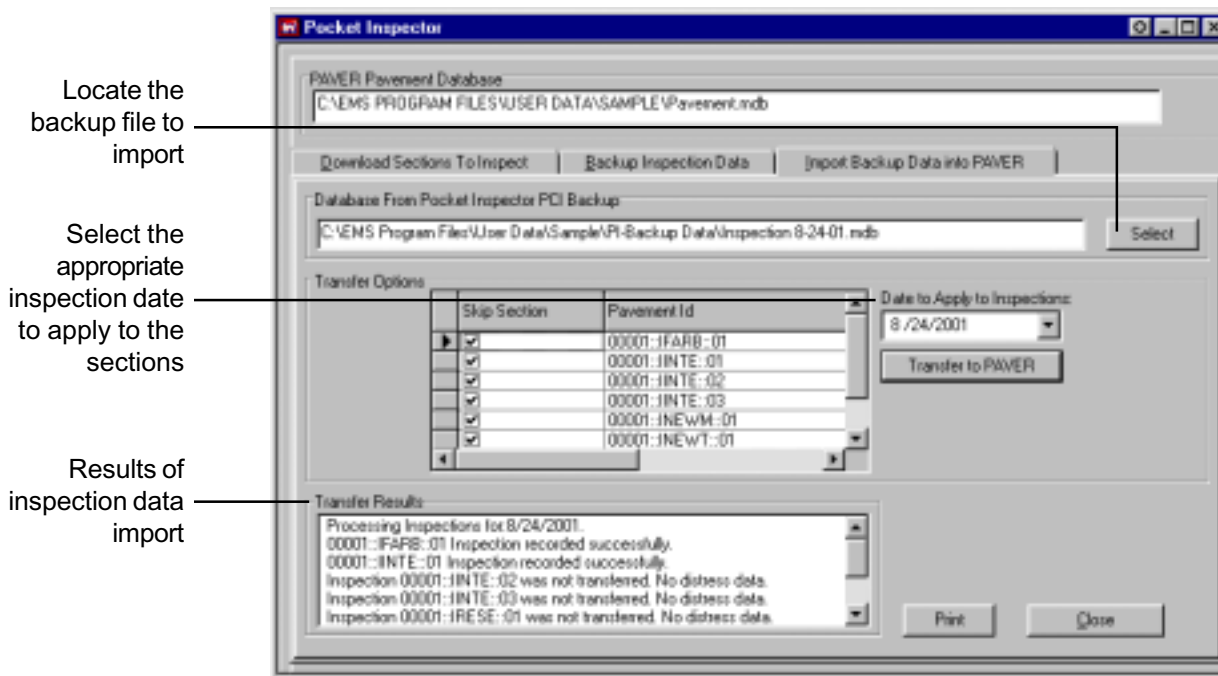
PAVER Shape File Converter

Converting from PAVER 4.x to 5.0

The **PAVER Shape File Converter** is used to convert shape files that were used in version 4.x of PAVER to be used in version 5.0 of PAVER. The difference between shape files in version 4.x and version 5.0 is that in 5.0 shape files now contain a Unique ID. The conversion of the shape file will check to see if the file contains a Unique ID and add the field, if necessary. Converting coverages from PAVER 4.x to 5.0 is a two step process. You must first take the PAVER 4.x coverage file into ArcView and convert the *.cov file to a shape file (*.shp). To complete the process, the shape file must be converted using the **PAVER Shape File Converter**. Once the shape file is converted, the process is completed.

<table>
<tr><td>

Note

When converting shape files, the database that is to be associated with the shape file must be online for the procedure to work correctly.

</td></tr>
</table>

Shape File Conversion Procedure

The **PAVER Shape File Converter** module contains three sections. The first section displays the **Source Shape File**, the second section displays the **Destination Shape File**, and the third section displays the results of the convers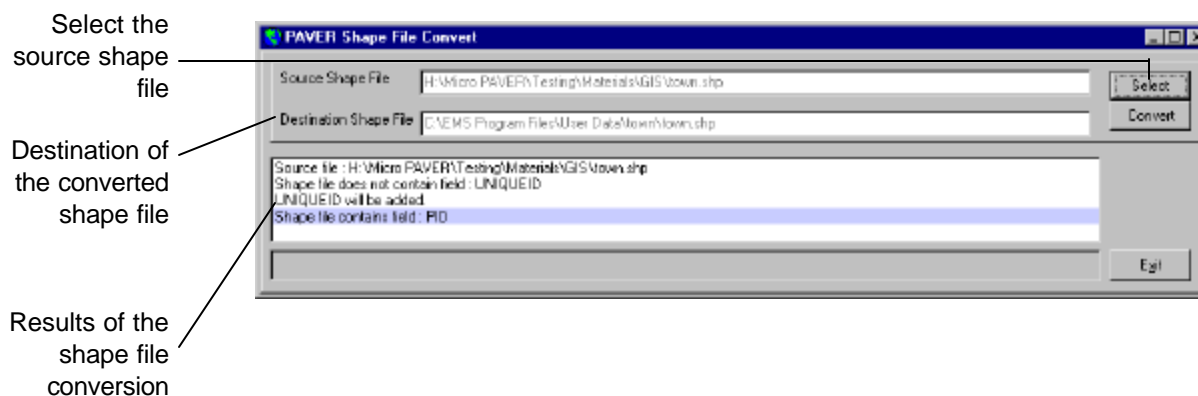ion process. You must first locate the shape file you wish to convert. This is done by clicking the **Select** button to browse your computer for appropriate files. Once the file is selected, PAVER then checks that the file contains a UNIQUEID and PID. PAVER also automatically sets the destination of the converted file in the folder for the online database. To complete the conversion process click the **Convert** button. As the conversion takes place, the results will be shown in the lower window.

Select the source shape file

Destination of the converted shape file

Results of the shape file conversion

Shape File Coordinate Shift

The **Shape File Coordinate Shift** module functions like the PAVER Shape File Converter discussed above. However, this module also allows you to shift the coordinates of the shape file during conversion. Similarly, the **Shape File Coordinate Shift** is also divided into three sections. The first section displays the **Source Shape File**, the second section displays the **Destination Shape File**, and the third section displays the results of the conversion process. You must first locate the shape file you wish to convert. This is done by clicking the **Select** button to browse your computer for appropriate files.

Once the file is selected, PAVER then checks that the file contains a UNIQUEID and PID. The coordinates of the selected shape file are displayed. Once the file is loaded, you may then click the **Select** button in the **Destination Shape File** area of the box. After selecting the destination file you are then able to select the appropriate **Shift Mode** for the converted shape file. You may select a premade shift mode or a **User Specified** shift mode from the drop down box. To complete the conversion process click the **Convert** button. As the conversion takes place, the results will be shown in the lower window.

Select the source shape file

Destination of the converted shape file

Choose the desired Shift Mode

Results of the shape file conversion
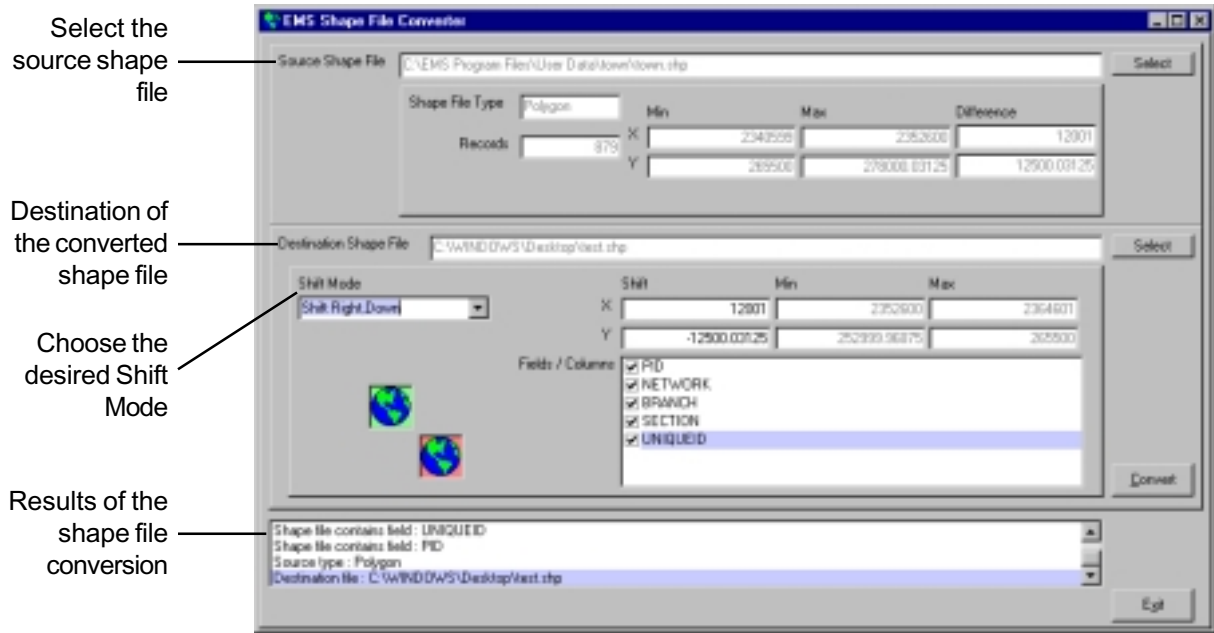
Appendix A

PAVER/GIS Map Development

The following manuel outlines one method for the linking of a Micro PAVER database and an electronic map of a paved area through the use of Geographical Information System (GIS) software. It does not represent the only way in which this process can be completed. We do not specifically endorse any of the software mentioned in the manual but rather; we have outlined a generic procedure that may be transferable to other applications. While the procedure makes references to specific commands used within the respected software, similar functions are available in other programs. Please consult the user manuals of your software for comparable applications.

Overview

Incorporating GIS technology into pavement management provides an additional tool for visually displaying the results of PAVER database information. Once the completed database is linked to the digital map, information such as pavement use and current condition can be displayed immediately. The pavement information is shown on the map via convenient color schema through a program such as ArcView. Once PAVER M&R workplans are run, pavement condition according to year can also be visually displayed. Consequences of not doing the recommended work can be displayed in conjunction with the execution of PAVER condition analysis reports.

GIS map development enables pavement information (e.g., inventory, inspection data, condition analysis, work planning, etc.) to be displayed on a map via convenient color schema. The process of GIS map development is composed of three main sub pro-cesses. First, existing AutoCAD© maps are cleaned (i.e., all polygons are closed). Second, the clean maps are converted into GIS Coverages using ArcCAD©. *A GIS Coverage is a set of files that contain the map and either a polygon attribute table (PAT), or arc attribute table (AAT) based on whether polygon or lines are used in the map.* Third, a link table is created manually using PAVERGIS that connects the MicroPAVER database with the GIS Coverage (i.e., each pavement feature in the MicroPAVER database is linked to the appropriate polygon in the GIS Coverage). After the link between the Micro PAVER database and the GIS Coverage has been made, pavement data may be displayed in GIS.

Developing the CAD Drawing

The first step in the creation of the GIS Coverage is to develop and "clean" an electronic map of the area to be included in the Coverage. There are two primary drawings that are being created in this step. The first is a labeled map (figure 1) showing pavement identification numbers (PID) for the sections that are included in the database. The second is a clean version of the above drawing including only the pavement and section drawing entities displayed on a single layer (exploded) as closed polygons. It is this second file that is opened in ArcCAD© for creation of the GIS Coverage.

Creating a labeled CAD map of the Coverage area through network definition

Network definition is the process of dividing an installation's pavements into a hierarchical order to facilitate inspection and maintenance planning. Using either an existing AutoCAD© drawing of the Coverage area (figure 1) or after creating a new one, the paving elements are broken into a hierarchy consisting of Network(s), Branches, and Sections. This drawing wil be used as the basis for the GIS coverage, for reference purposes in locating sections during the link process, and as an accouting tool (to note which elements have been placed in the database or linked) during varius stages of the GIS map development process.

Terminology

Network – A group of pavements that will usually be managed together.

Branches – a readily identifiable part of the pavement network that has a distinct function. For example, individual roads or parking lots are normally considered branches. A branch may be composed of one or more sections.

Sections – the smallest management unit when considering the application of major maintenance and repair. Factors to consider when dividing a branch into sections include pavement structure, traffic, construction history, and pavement rank (or functional classification).

Sectioning a drawing consists of drawing lines across intersections or parking lots so that each section is completely enclosed. Each section is then labeled using a leader and callout showing the items PID (figure 1), as it will be entered into the PAVER database. All non-relevant items (i.e. elements that are not to be displayed in the final GIS map such as buildings, sidewalks, or unpaved roads) are placed on individual layers so that they may be isolated later. Any buildings or other elements that make up the boarders of sections

> **Note**
>
> All sections must be completely enclosed by lines so that there are no gaps at the perimeter. It is not advisable to use the AutoCAD© polygon or polyline features since they can cause errors further in the process. Rather, as long as the individual section is completely enclosed ArcCAD© will create a formal polygon during the Coverage creation process.

need to be traced or copied to keep the integrity of the section perimeters when the layers are isolated. At this point one should be able to isolate only the pavement outlines, section indicators, and PID callouts. Once the labeled drawing has been created, a copy is made saving it as "sample_arcad.dwg", which denotes it as the base ArcCAD© drawing *(For the purpose of this manual, files will be referred to as "sample". You should name your files with names that are convenient for your filing system).*
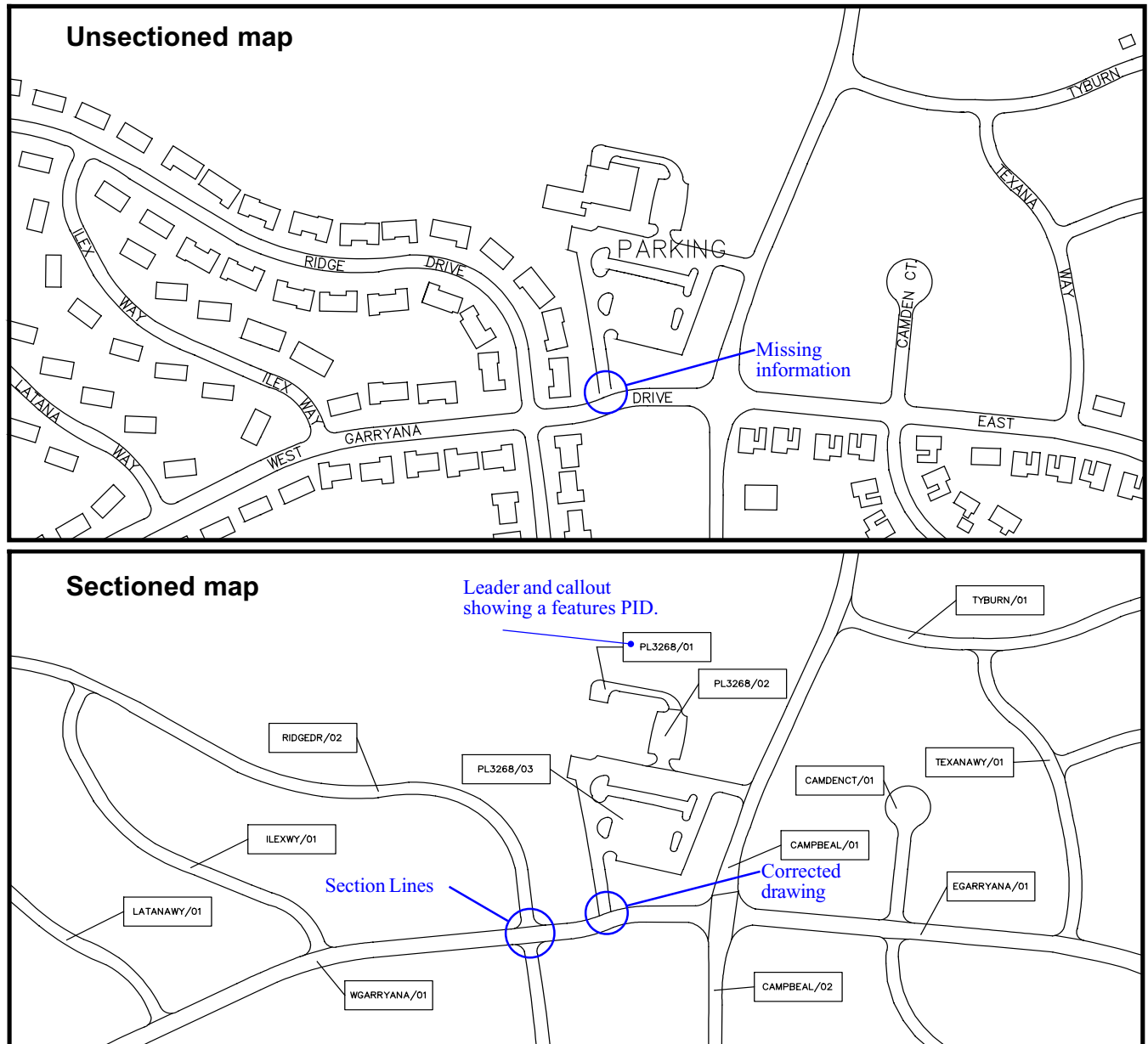
Figure 1

Creating a clean CAD drawing for placement in ArcCAD©

Using the Sample_arcad.dwg file all non-pavement elements are deleted from the drawing, including the PID labels, and the pavement elements are relocated to the default layer "0" in AutoCAD©. The drawing elements are then exploded using the EXPLODE comand in AutoCAD© in order to break grouped objects in to their individial drawing elements. Finally the PURGE command is used three times to remove nongraphic items stored in the drawing such as layers, blocks, groups, and any saved styles (it is neccessary to purge three times to assure that all nongraphic items have been removed).

Creating the Coverage Using ArcCAD©

In this step a GIS coverage is created utilizing the "clean" electronic map created in step 1. This process involves first defining a theme, then creating a coverage, and finally verifiing the accurace of the coverage in relation to the original map. If errors are found in the coverage they are fixed at this time.

Terminology

Coverage – A Coverage represents the basic unit of a GIS data set. It contains both the map feature items (i.e., polygons) and map feature attributes (i.e., PID, area, branch use, etc).

Theme – A collection of geographical features with user defined common characteristics (i.e., streets, parking lots, or airfields. For our use, all paving elements are grouped into a common theme)

Feature – the real world phenomena that are represented. In this case each closed area of an electronic map that represents a section of a paving area, such as street, is considered a feature. A feature corresponds to the graphical representation of the Micro PAVER section within the GIS map.

Defining a THEME

(1) Open the Sample_arcad.dwg file in ArcCAD©

(2) Type **(load"arcad")** at the command prompt to reload the ArcCAD© menus after opening the AutoCAD© file.

(3) From the pull down menu select THEME, DD THEME

(4) In the THEME dialog box (figure 2) under THEME INFORMATION, type in the name of the Coverage that is to be created using only alphanumeric charac ters. It is useful to number the Coverage's names as sample1, sample2, since the Coverage creation process usually takes several attempts.

(5) Under FEATURE CLASS select POLYGON

(6) The DATA SET is the location where the Coverage is to be created. In order to mitigate errors, a temporary folder should be created to store the Coverage. It is important that the last folder name match that of the theme name (Ex. THEME = sample1, DATA SET = C:\TEMP\SAMPLE1). **No spaces may be used when naming folders.**

(7) Click APPLY and the THEME will appear in the EXISTING THEMES window.
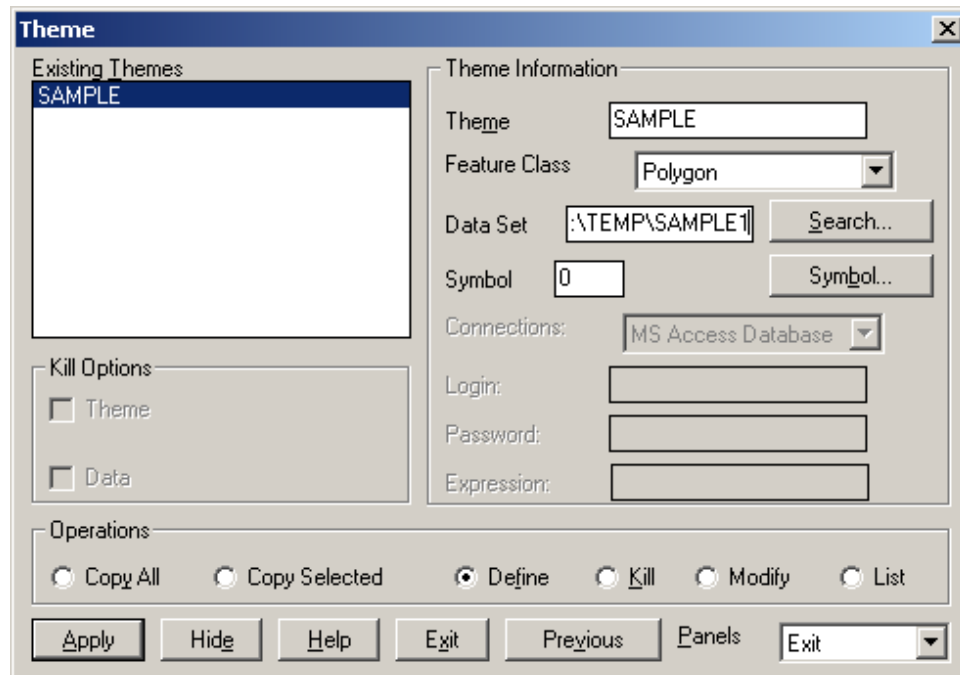
(8) Hit EXIT to close the dialog box.

Figure 2

Creating the COVERAGE

(1)   From the pull down menu in ArcCAD© select FEATURES, ADD FEATURES (figure 3)*(make sure the correct theme name appears in the command line and if not enter it now).*
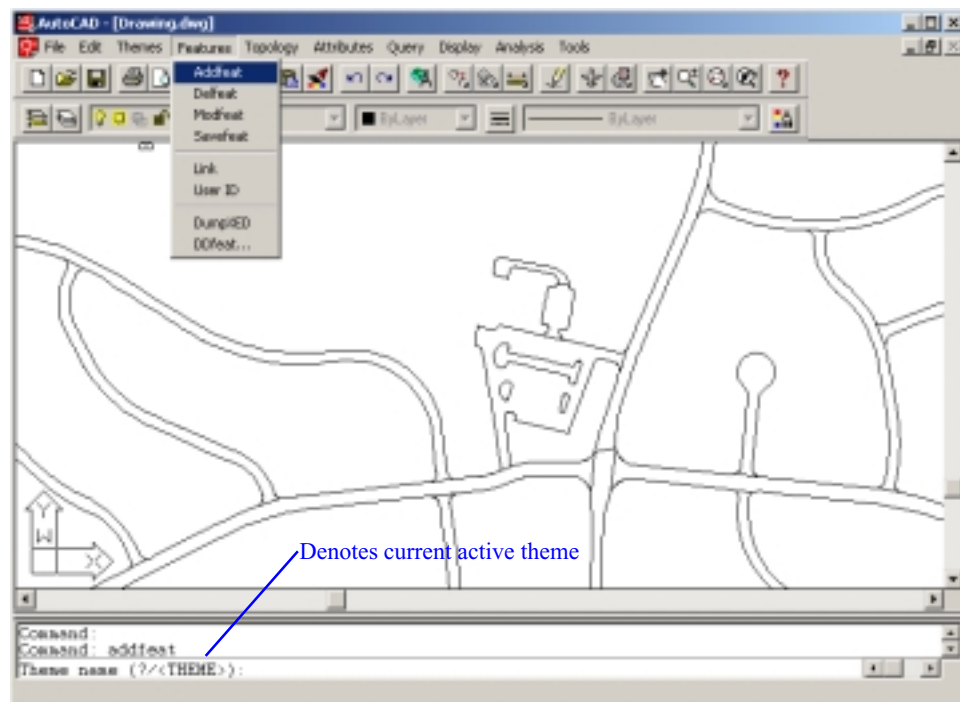

Denotes current active theme

Figure 3

(2)   Select the entire drawing *(if creating the Coverage for the first time)* and enter through the options displayed on the command line until the UPDATE TOPOLOGY dialog box opens. The UPDATE, TOPOLOGY command can also be reached by selecting TOPOLOGY, CLEAN from the pull down menu.

(3)   Select CLEAN NOW, confirm that the proper theme name appears in the command line and enter through all of the options. At this point the Coverage has been created.

Verify Coverage and fix errors

(1)   From the pull down menu select FILE, NEW *(when prompted to save the file click no. The AutoCAD© lines have been converted to polygons and saved in the polygon/point attribute table (PAT.dbf) file that was created in part 2-c above. The original s*ample_arcad.dwg file can always be accessed again if needed.)*

(2)   Follow steps **(2)** through **(8)** in part **2-b.** again entering the THEME name that was just created and the corresponding DATA SET. *(At this point the THEME has been loaded but is not viewable)*

(3)   From the pull down menu select DISPLAY, POLYGONS, POLYS. Make sure the correct theme name appears in the command line and right click through the options. After the command is complete you must zoom to extents to view the Coverage. *(At this point the Coverage should be displayed and must be checked for errors.)*

(4)   From the pull down menu select TOPOLOGY, NODERROR (figure 4). Make sure the correct theme name appears in the command line. Right click through
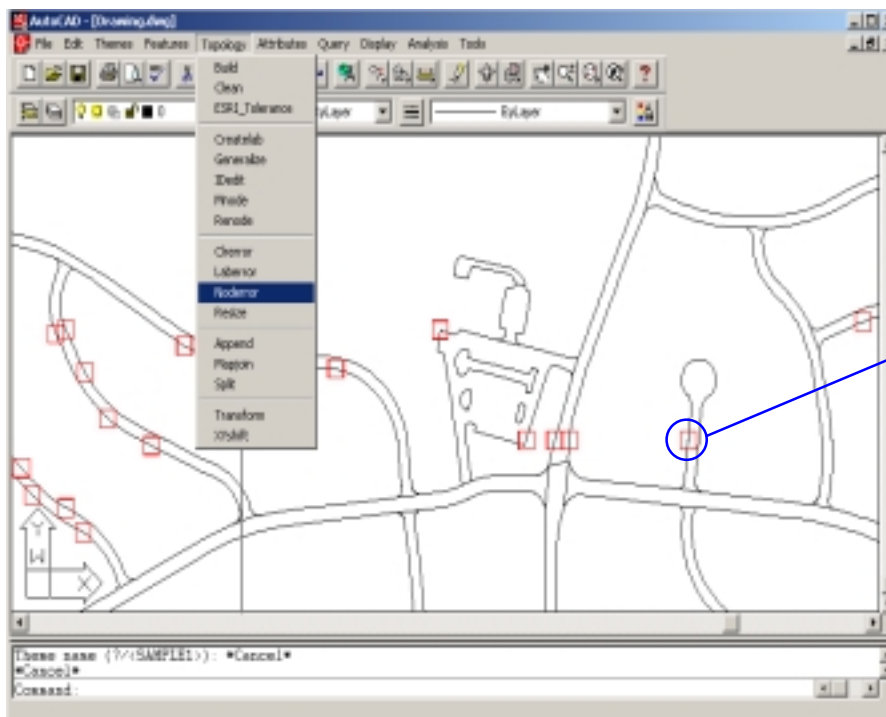
Note:
The NODERROR command displays the error boxes centered on the endpoint of a line adjacent to gaps.

Figure 4

the options but at ERROR TYPE hit "D" for DANGLE. The red boxes that appear denote an error.   If the scale of the boxes is too large go to TOPOL-OGY, CLRERROR to remove the error boxes, zoom in on the drawing and perform a new node error. Fix any gaps shown by the node errors and erase the red boxes from the screen.

Note

Errors are caused when gaps are detected in the closed polygons of the AutoCAD drawing. If small gaps exist ArcCAD will allow you to fix them using the NODE ERROR command. If large gaps exist whole sections of the drawing may be missing from the Coverage. In this case there are two options. First, if the majority of the drawing is missing from the Coverage, go back to the original sample_arcad.dwg file and fix the gaps there. They will most likely be located on the boundary of where the missing areas of the Coverage meet what is displayed in the Coverage. Using the corrected drawing create a new Coverage. Second, redraw the missing areas in ArcCAD© and update the Coverage.

(5)   In order to fix missing areas of the Coverage you must copy and paste them from the AutoCAD© file into the Coverage. From here the missing sections will have to be traced using standard AutoCAD© drawing techniques and the copied information erased. Simply exploding the pasted information will not work. Make sure to use snaps to prevent any new gaps in the closed polygons. (The F3 key will allow you to set up your snaps in ArcCAD©.)

(6)   Once the node errors and the missing information is added to the drawing follow the steps above to create a new THEME and COVERAGE giving it a new name (i.e. Sample2). Be sure to select all of the drawing when creating the new coverage.

(7)   Repeat the verification process until no errors occur and the Coverage dis played exactly matches the original AutoCAD© map of the Coverage area, each time creating a new theme name. The last theme created will be used in the link process of PAVERGIS.

(8)   The last step in the creation of the Coverage is to edit the PAT.dbf file that ArcCAD© creates. Using software that will open dBASE-compatible database files such as Microsoft Excel© open the PAT.dbf file that is located in the folder of the last Coverage that was created (figure 5). The columns labeled "SAMPLE_" and "SAMPLE_ID" (the headings will contain the name of the particular theme you are working with) represent the internal-id numbers, or POLYGON ID (the number that ArcCAD© gives to each polygon as it creates the Coverage, starting from top left to bottom right in the drawing) and the user-id numbers respectively for each feature in the Coverage. All information in the "SAMPLE_" column must be copied to the "SAMPLE_ID" column while retaining the original column headings. The file must now be purged of extrainous fields.

(9)   During the link process errors will occur if the PAT.dbf file has too many fields (each column displayed in Excel© corresponds to a field in the database). All columns must be deleted except for the ones containing information relating to

---

the primary fields. These will vary based on the application but in the case outlined here the primary fields are; **area, perimeter, internal-id** (SAMPLE_)**, user-id** (SAMPLE_ID)**,** and **PID,** all other columns are to be erased from the file (figure 5)**.** Finally, save the PAT.dbf file by overwriting the original file in the exisitng d-base format and exit the program.

Fields to be deleted

Polygon-ID

Internal-ID

Note

When the CLEAN command is used during the coverage creation process ArcCAD© creates the PAT.dbf file. ArcCAD numbers each polygon in the drawing starting from the upper left to the bottom right of the drawing. These numbers are placed in the Internal-ID column of the PAT.dbf file. Once the final coverage is complete and free of errors the PAT.dbf must be edited so that the Polygon-ID and Internal-ID columns display the same information.

Figure 5

Manual creation of a link table that connects PAVERGIS with the GIS Coverage

The third step in the Micro PAVER GIS Map Development process involves the linkage of the PAVER database with the coverage that was created in step 2. In order to accomplish this phase of the process the Polygon Ids of the features to be linked are entered into the PAVER/GIS link table. Using the functions avaible in PAVER/GIS the PAT.dbf is then updated so that relevant database information can be displayed using ArcVIEW© or another GIS compatible program.

Preparing the data

(1)   Open the Micro PAVER program and click on the PAVERGIS button.

(2)   From the pull down menu select SETUP, AVAILABLE DATA SOURCES.

(3)   In the PAVER 4.0 Data window click ADD and locate the .pvr file that contains the corresponding database for the Coverage that was created (figure 6). Click OK and enter a description for the file and click OK again.

(4)   In the GIS Map Coverage window click ADD and locate the PAT.dbf file for the Coverage that was created in part 2 (it will be located in the folder with the same name as the last Theme that was created). Click OK and enter a descrip tion for the file and click OK again.

(5)   Click the NEXT button to open the Data Preparation Export / Import screen (This screen can also be reached from the pull down menu through SETUP, PREPARE DATA).
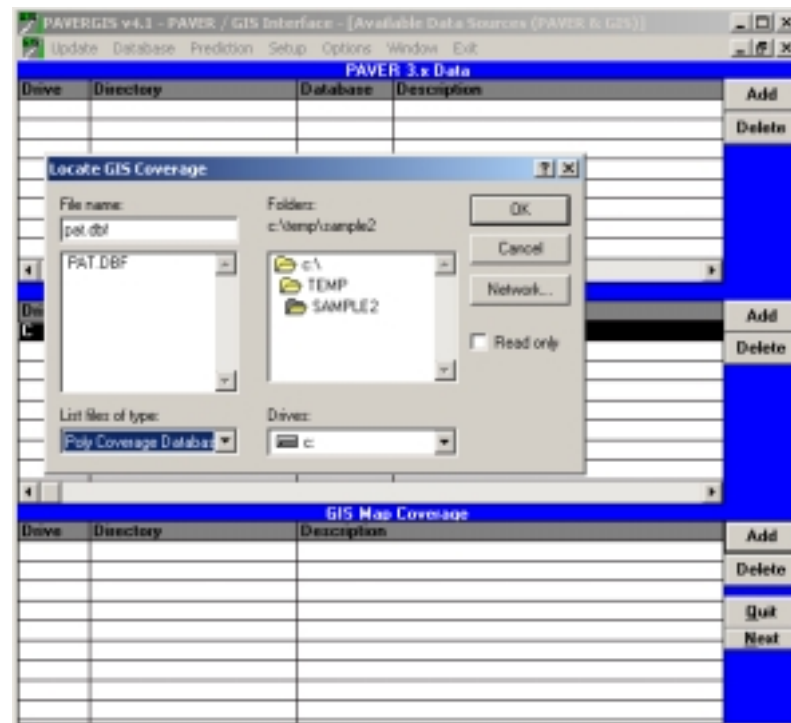
Figure 6

(6)   In the PAVER Data window click the v4.0 button and in the adjacent drop down list locate the PAVER database file that is labeled with the description of the database you wish to link (figure 7).

Note:
When updating the PAT/ATT from export both the **Update link** and **Initialize** buttons must be checked!
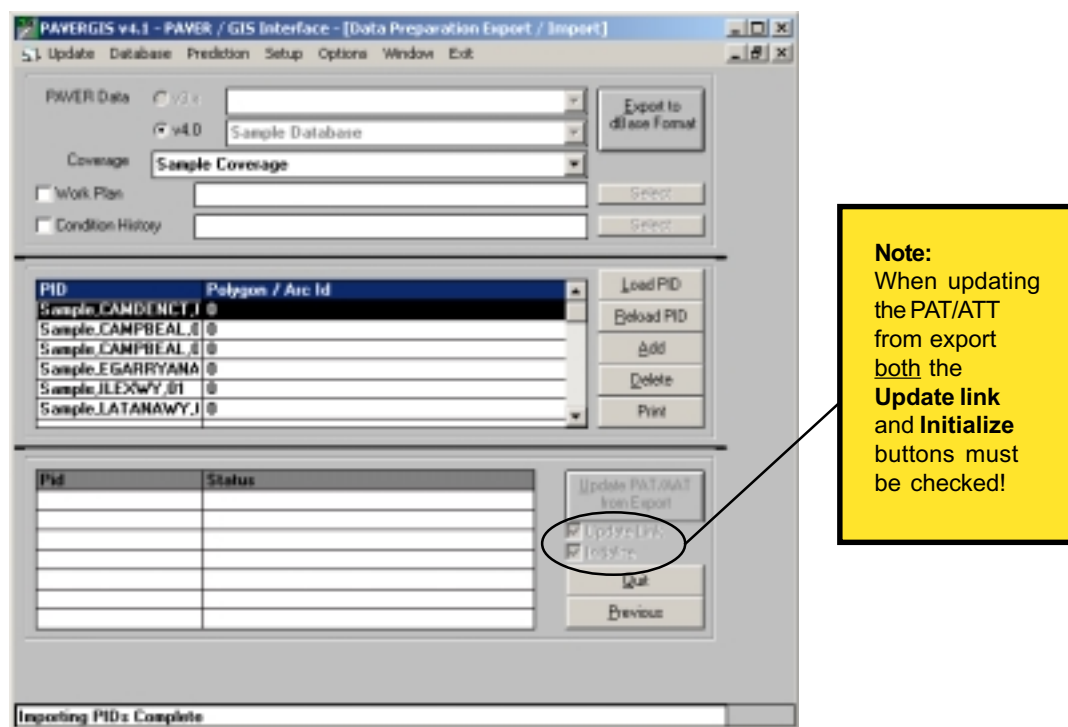
Figure 7

(7)   In the Coverage drop down list locate the Coverage file that is to be linked.

(8)   Click the EXPORT TO DBASE FORMAT BUTTON.

(9)   Click LOAD PID, a window will open asking if you want to continue, click YES

Note

After this process is complete, the center table of the PAVER / GIS Interface screen (known as the LINK TABLE) will display new information. In the PID column all of the paving sections that are in the database will be displayed in alphabetical order. The POLYGON/ARC ID column will display the Polygon ID that ArcCAD© gave to each respective section in the Coverage. In this case it reads as zero (0) since no links have been made. In order to link the Coverage and the database the Polygon ID that ArcCAD© assigns to each polygon in the Coverage must be entered into the Polygon / Arc Id column of the PAVER / GIS Interface screen for each polygon's corresponding PID. The easiest way to do this is to print out a PID list from the database, use ArcVIEW© to display the Coverage's Polygon IDs, and use the labeled AutoCAD© drawing as a map to locate each section within ArcVIEW©. To print the Link Table click the print button to the right of the table. If you are using an older version of PAVER this function may not work. In this case open the PAVER dBASE file that will be located in the CERL.ITS\ITS.RUN\PAVER40\"DatabaseName" in the drive that PAVER was installed in. Print the PID column of the file.

Viewing Polygon Ids with ArcVIEW©

(1)   Open the ArcVIEW© software. When prompted, click the CREATE A NEW PROJECT – WITH A NEW VIEW button and click OK.

(2)   When asked to add new data, click yes and locate the Coverage that was created using ArcCAD© and click OK. A new window will appear labeled View 1. Click the box to the left of the Coverage name to display it.

(3)   To remove the automatic coloring of the drawing double click the colored box below the coverage name to open the Legend Editor window. From here double click the colored box in the symbol column to open the Fill Palette window (figure 8). In the Fill Palette window click the blank box in the top left. Close the Fill Palette window. Hit APPLY in the Legend Editor window and then close it. The Coverage will now be displayed with only the polygon borders showing.

(4)   To display Polygon Ids, from the pull down menu go to THEME, AUTOLABEL to open the Auto-Label dialog box (figure 9). Using the LA BEL FIELD pull down menu select "SAMPLE_" which corresponds to the heading of the Polygon ID column of the dBASE file. Leave all other default options as they are and hit OK.   The Coverage will now be displayed with the Polygon Id in each polygon. ArcVIEW© places the label in the center of the polygon. (As with the Node Error function in ArcCAD©, ArcVIEW© will scale the labels to the current view. It may be necessary to zoom in before the label function is used). The labels can be removed by selecting THEME, REMOVE LABELS.
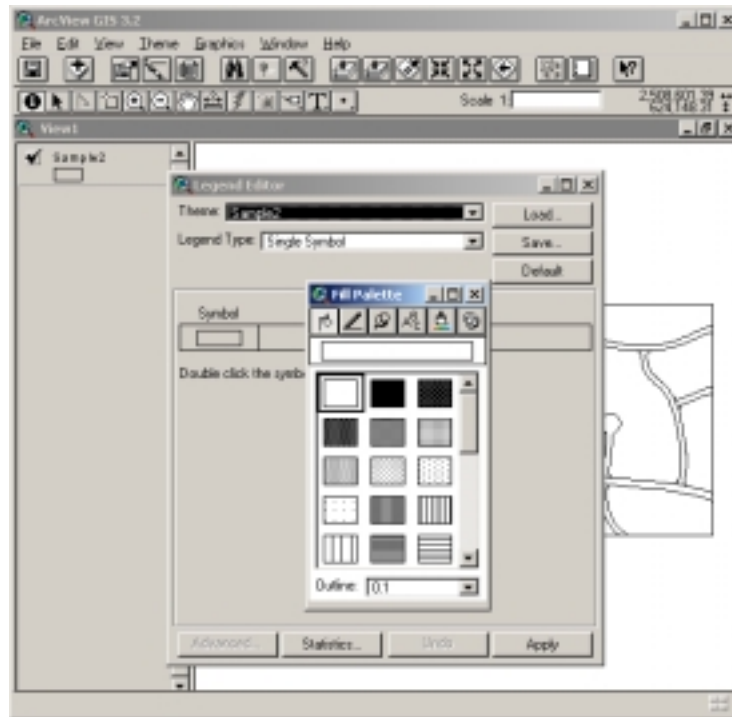
Figure 8
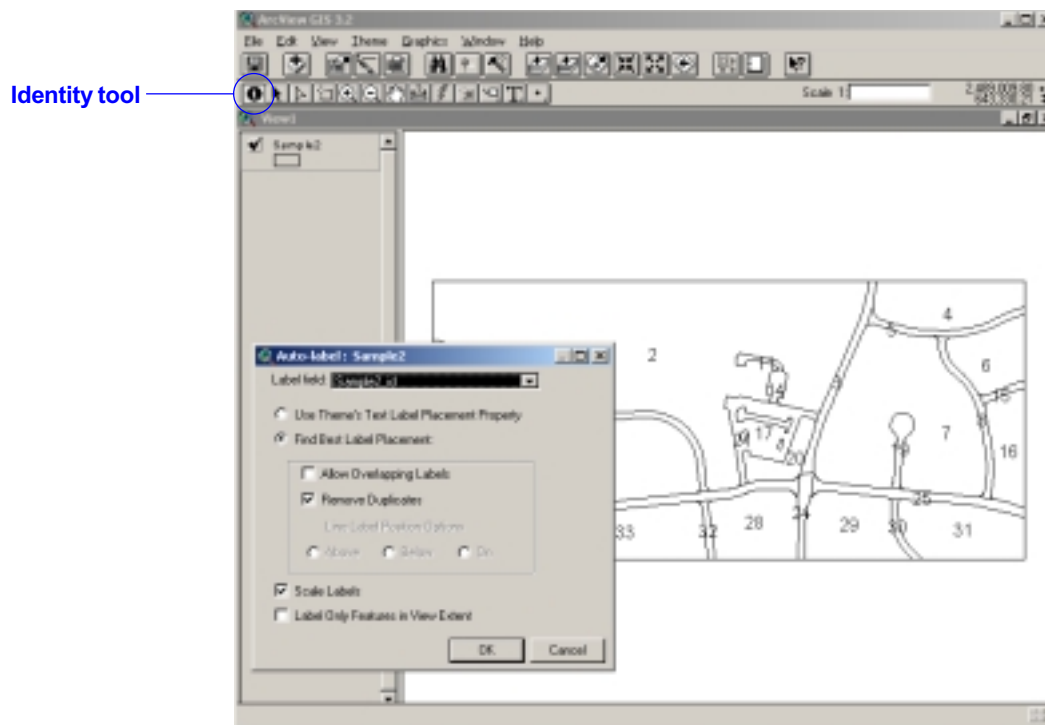
Figure 9
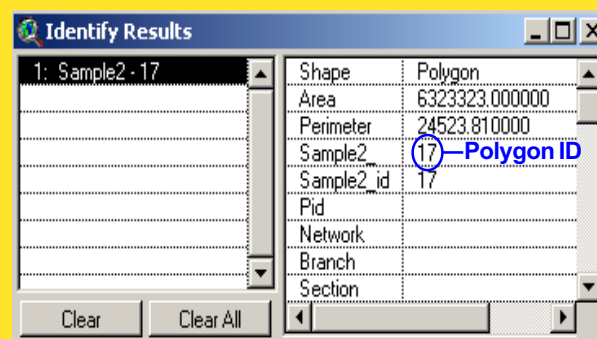
Linking the Polygon IDs to the PAVER database

In order to accurately record the Polygon Ids for linking, the labeled AutoCAD drawing is used in conjunction with the ArcVIEW© display of the Coverage.

(1) Locate a paving section in the AutoCAD© drawing and find the corresponding section in ArcVIEW© (the pan, zoom, and identity tools are helpful for naviga tion through ArcVIEW©).

(2) Record the internal-id-number (as displayed in ArcVIEW©) for that section next to its PID on the printed list.

(3)   Once the section has been recorded it is helpful to use the hatch function in AutoCAD© to mark that label as complete in the drawing (it is useful to create a separate layer in AutoCAD© so that the hatching may be isolated in the future).

(4)   Repeat this process until all the PIDs on the printed list have a corresponding internal-id-number.

> **Note**
> You may come across errors in the coverage during the link process. Note the errors and continue to update the link table. If for any reason a specic feature is not in the coverage and therefor does not have a Polygon ID use a dummy ID from polygon of a **non-pavement** in the general visinity of the missing feature. This will prevent the PID from being deleted from the link table. **DO NOT USE THE SAME POLYGON ID AS AN-OTHER FEATURE. DUPLICATE POLYGON ID'S IN THE LINK TABLE WILL CAUSE AN ERROR.** Follow the steps for **Updating the Coverage and Database with new information** to correct the coverage.

Updating the Link Table

(1)   Reopen PAVERGIS and go to the Data Preparation window.

(2)   Using the Polygon Ids that were recorded, enter the data into the link table.

(3)   In the Polygon / Arc Id column record the Polygon Id for each PID by clicking in its corresponding cell.

(4)   Repeat this process for each PID until all have been entered in the link table.

(5)   If a PID has more than one Polygon Id, right click on the cell containing the corresponding PID and select duplicate PID (the first time this is done a window will open asking to duplicate the PID without add, new or edit, click YES). Repeat this as necessary to get the required numbers of copies.

> **IMPORTANT:**
> Once the coverage has been linked do not perform the CLEAN command in ArcCAD on that coverage again. This will overwrite the PAT.dbf and remove the links to the MicroPAVER database.

(6)   Once all the Polygon Ids have been entered, click UPDATE PAT/AAT FROM EXPORT with both the default options of UPDATE LINK and INITIALIZE selected. (This step updates the PAT.dbf file by adding the PAVER data for each PID to the corresponding Polygon Id in the PAT.dbf file allowing you to access this information in ArcVIEW.)

(7)   The bottom table in PAVER / GIS Interface screen now displays the status of each link. Scroll through the table to look for errors.

> **Note**
> There are several common errors that can occur at this point.
> - If two or more PIDs having the same Polygon Id are placed in the link table an error will occur.
> - If no Polygon Id was entered an error widow will appear before the Update process completes.
> - If PAVER is running while PAVERGIS is running an error will appear when either the EXPORT or UPDATE functions are used.
> - If the extranouse fields were not removed from the PAT.dbf file prior to using the **Update PAT/AAT from Export** function the command will not function properly.

Displaying Pavement Data Using ArcVIEW© and Checking for Errors

This portion of the process involves verifing that the linkage process in step 3 was performed accurratly. In order to acomplish this the linked coverage is displayed and all pavement sections are inspected to verify that the porper polygons have been linked. If any errors are found they are corrected at this time.

Creating an ArcVIEW© project

(1) Open the ArcVIEW© software. When prompted to create a new project select OPEN AN EXISTING PROJECT.

(2) In the OPEN PROJECT window open the CERL.ITS\ITS.RUN\PAVER40 PVR42AV3.APR file that is located in the drive that PAVER was installed. If the Update pvr42av3.apr window opens, click YES.

(3) From the pull down menu select PAVEMENT VIEWS, CREATE VIEWS FOR PAVEMENT INFORMATION.

(4) In the SAVE PROJECT AS window choose a name and directory to save the file.

(5) In the PAVEMENT COVERAGE window locate your Coverage folder and click the coverage that you are working with (this will create the pavement views).

(6) Once the views have been created, select GENERAL INFORMATION to display the Coverage (if Pavement Outlines has not been checked once the General Information window opens, do so now).

(7) ArcVIEW© will now allow you to highlight the Coverage based on specific criteria given to it in PAVER (i.e., Branch Use, Branch Id, Surface Type, ect.)

Checking the linked Coverage for errors

(1) You can now check that the Coverage has been linked correctly. The easiest way to do this is to highlight the Coverage by **Branch Use** since this is a criterion that applies to all entries in the database.

(2) Check **Branch Use** to highlight the Coverage. Any section that is not high lighted is either not linked to the database or it has been entered as a nonpavement.

(3)　　You can also use the IDENTITY tool to verify the information for each section (if the IDENTITY tool can not be used click in the gray area to the left of the Coverage to highlight one of the General Information criteria).

(4)　　If there are errors, the link table can be reopened in PAVERGIS, but this time click RELOAD PID after performing the EXPORT TO DBASE command. This allows you to access the information that was added earlier. Follow the rest of the steps for **Updating the Link Table** and **Displaying the Pavement Data** again.

(5)　　If the Coverage is displayed correctly the MicroPAVER – GIS Map Development process is complete.

Updating the Coverage and Database with New Information

When updating a coverage the exact process used will depend on the information that is being changed. Generally, adding features to a coverage and removing features from a coverage cannot be done simultaneously. ArcCAD© provides several spatial analysis tools that allow you to alter a coverage while maintaining the integrity of the PAT file, thereby eliminating the need to manually repopulate the link table. **Once the coverage has been created it <u>cannot</u> be edited without using the spatial analysis tools, never manually remove features from the coverage.** These analysis tools work by merging two overlapping coverages into a third output coverage. **It is advisable to make a copy of the existing coverage folder before any changes are made.** Outlined below are several scenarios for altering a coverage.

Adding Features

(1)　　Display the coverage that you wish to modify in ArcCAD©.

(2)　　Draw the new information in the coverage using standard AutoCAD© drawing techniqes (figure 10). (ArcCAD© aligns the coverage boundaries when per forming the analysis functions. If the new information is not located correctly or there are gaps in the new polygons the coverage could be corrupted.)

(3)　　Using the coverage that was just edited create a new THEME by following the steps outlined in **2-b. Defining a THEME (this new theme will become the union theme)** When adding features to the new theme select the new polygons and any adjacent polygons that will be affected by the edit.

(4)　　Create a new theme using THEME, DDTHEME **(this is the output theme)**.
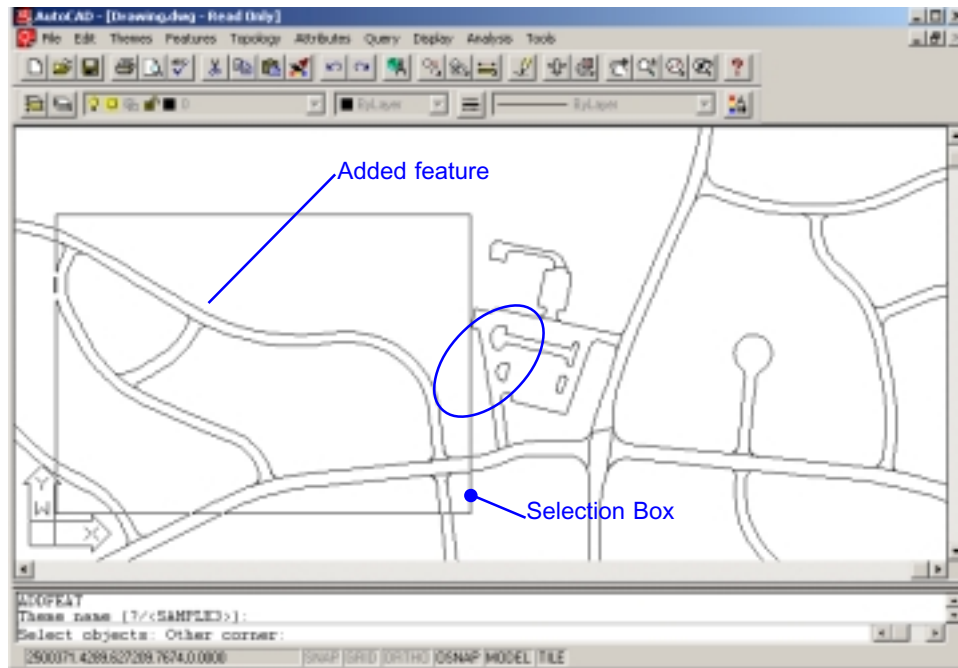
Figure 10

(5)   Make sure the original linked coverage **(input theme)**, union theme, and output theme are all loaded in the themes dialog box. If not, load them now.

(6)   From the pull down menu select ANALYSIS, ESRI_UNION. Enter the theme name for the input, union, and output theme as prompted at the command line and enter through the remainder of the command.

(7)   Open a new drawing and display the output coverage to verify your changes.

(8)   Edit the PAT.dbf file for the new coverage (figure 11). It will be located in the folder that was created with the output coverage. As before overwrite the user ID column with the polygon ID column information while retaining the original column headings, for the new coverage. Delete all columns that do not contain map feature attributes, this includes the POLYGON ID and USER ID columns for both the INPUT and UNION themes. Save the file by overwriting the existing PAT.dbf file in d-base format.

(9)   Open Micro PAVER and update the database if you are adding new paving sections to the coverage rather than fixing an error or merging features.

(10)   Open PAVERGIS and select SETUP, AVAILABLE DATA SOURCES from the pull down menu.

(11)   In the GIS Map Coverage window click ADD and locate the PAT.dbf file for the updated coverage. Click OK, enter a description for the coverage, and click OK to exit the function.

(12)   Click NEXT to open the Data Preparation Export/Import screen. Select the coverage you just loaded from the Coverage pull-down selector.

(13)   Click RELOAD PID to load the link table. **Once a coverage has been linked the link table information is stored with the coverage and not the**

PAVER dBASE file. LOAD PID loads the link table from the PAVER dBASE file and RELOAD PID loads the link table from the Coverage. *At this point the POLYGON ARC ID portion of the link table displays the POLYGON ID's for the updated coverage (they will be different then the ones entered originally because* ArcCAD© *updated them after the coverage was altered). You must now verify the POLYGON ID's for the new or additional features and their surrounding polygons.*

Copy Internal-ID information into the Polygon-ID column

Delete all non map feature attribute columns
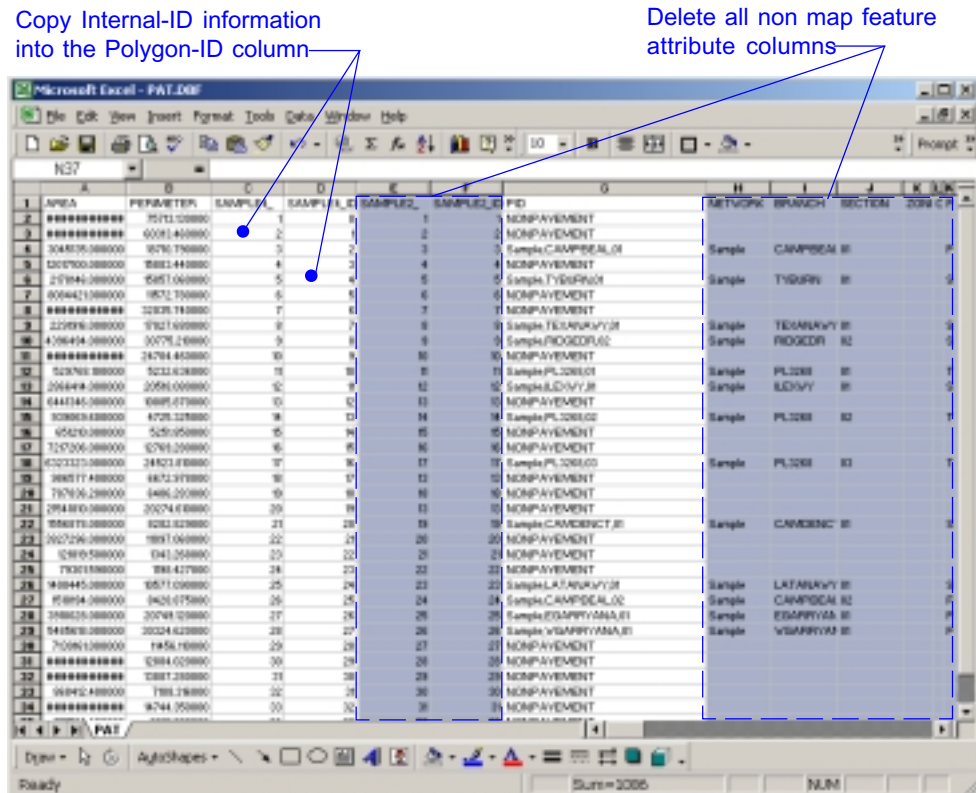
Figure 11

(14)   Load the coverage in either ArcCAD© or ArcVIEW© so that the POLYGON ID information can be recorded.

(15)   Using either the IDENTIFY tool in ArcCAD© or the IDENTITY tool in ArcVIEW©, record the POLYGON ID for the added features and any adjacent features. *Depending on the alterations to the coverage, such as adding a new section line to a feature, the POLYGON ID in the link table for the original feature may be incorrect. It is wise to verify the link information for all features that are adjacent to the updated portion(s) of the coverage.*

(16)   In PAVERGIS update the link table with the correct POLYGON IDs. If additions were made to the PAVER database they will not be reflected in the link table. These must be added manually. Use the add function to the right of the link table to add a line to the table. **You must add the PID information (network, branch, and section) exactly as it is recorded in the database. The link process is character and case sensitive.** *If major changes were made to the database, such as the name of a network, rather then changing each PID in the link table, open the PAT.dbf file in Excel© and use the find and replace function to alter the data.*

(17)   Remove all lines in the link table that have the same POLYGON ID as the features that were added to the coverage. *All non-linked polygons in the coverage will show up as non-pavements in the link table. Any non-pavement polygon that has been altered in the coverage could have the same POLYGON ID as the new coverage feature.*

(18)   Once all changes have been made to the link table click EXPORT TO DBASE FORMAT and then click UPDATE PAT/AAT FROM EXPORT. Scroll through the status column to check for errors. The most common error is incorrect syntax between the database and the link table or two different PIDs linked to the same POLYGON ID,

(19)   Follow the steps outlined in **section 4 Displaying pavement data using ArcVIEW© and checking for errors.**

Removing Features

In order to remove features from a coverage without repopulating the link table the ArcCAD© DISSOLVE command can be used. This command functions by merging adjacent polygons that have the same value for a specified field in the PAT file and then creating a new PAT file. During the link process all non-linked polygons are given a default PID of *NONPAVEMENT.* If the DISSOLVE command is used on a coverage and two or more nonpavement polygons are adjacent to each other in the coverage they will be merged. Additionally, if linked polygons have the same PID and they are adjacent to each other they will be merged as well. The process outlined below details how the dissolve command can be used to effectivly remove only specific features from the coverage.

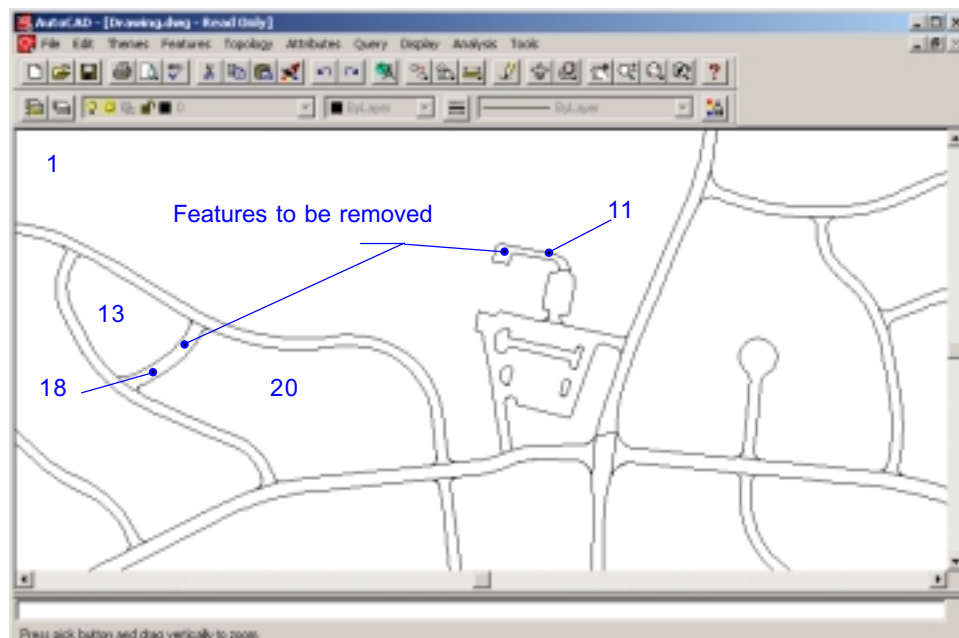(1)   Display the coverage that you want to modify in ArcCAD©.

Figure 12

(2)	Using the IDENTIFY tool described earlier, note the POLYGON ID of each polygon that is to be merged. *In the sample coverage shown in figure 12, feature 11 is to be removed by merging it into feature 1 and feature 18 is to be removed by merging it into features 13 and 20.* By default ArcCAD© gives the perimeter area of the coverage a POLYGON ID of 1.

(3)	Follow the steps in section **3-a Preparing the data** to reopen the link table of the coverage that you are editing.

(4)	In this example all the features that are to be removed by merging them into nonpavement (unlinked) sections. To accomplish this the PIDs of features 11 and 18 must be changed to NONPAVEMENT in the link table (be careful to use the correct syntax when editing the PID column).

(5)	Any nonpavement features in the coverage that you wish to keep must be given a unique PID in order to prevent them from being merged into their adjacent nonpavement features. The most useful technique is to give the feature a descriptive PID. *i.e. if a gravel parking lot is in the coverage because it will be paved in the future its current PID will be NONPAVEMENT in the link table. If the DISSOLVE command is used this feature will be merged into its neighboring nonpavement features in the coverage. To prevent this the parking lot can be given a new PID such as GRAVEL1. This will prevent this feature from being removed from the coverage. Note that if the gravel lot has a neighboring lot that will become a separate section when the lots are paved its PID must also be unique or the two lots will be merged into each other. For this reason the second lot's PID could be changed to GRAVEL2.*

(6)	After the changes have been made to the link table click EXPORT TO DBASE FORMAT and then click UPDATE PAT/AAT FROM EXPORT. Once the update process is complete the status table below the link table will show any errors in link table. This works by comparing the PIDs that are in the link table with those in the PAVER database. Any PID that has been changed to a unique PID (such as GRAVEL1 in the example above) will show up as an error since that PID does not exist in the database. These errors can be overlooked without corrupting the DISSOLVE process.

(7)	Open ArcCAD© and load the theme that you wish to edit and create a new theme that will become the output theme.

(8)	From the pull down menu select ANALYSIS, DISSOLVE.

(9)	When prompted at the command line enter the original linked coverage for the input theme and the new coverage to be created as the output theme.

(10)	When prompted for the first item, enter "all" for last item accept the default value of none.

(11)	When the DISSOLVE command ends erase the information displayed on the screen and display the new output coverage. (If the information on the screen is not erased ArcCAD© will display the new coverage on top of the existing one.) Verify that the new coverage is correct and close ArcCAD©.

(12)   Open Micro PAVER and remove any information that is no longer needed in the database. (Note: this step is not necessary if the data is needed for future use).

(13)   Open PAVERGIS and select SETUP, AVAILABLE DATA SOURCES from the pull down menu.

(14)   In the GIS Map Coverage window click ADD and locate the PAT.dbf file for the updated coverage. Click OK, enter a description for the coverage, and click OK to exit the function.

(15)   Click NEXT to open the Data Preparation Export/Import screen. Select the coverage you just loaded from the Coverage pull-down menu.

(16)   Click RELOAD PID to load the link table. **Do not click LOAD PID or you may remove the links from the link table.** *At this point the POLYGON ARC ID portion of the link table displays the POLYGON ID's for the updated coverage (they will be different then the ones entered originally because* ArcCAD© *updated them after the coverage was altered). You must now verify the POLYGON ID's for the updated features and the surrounding polygons.*

(17)   Remove all lines from the link table that refer to features that have been re moved if any are displayed.

(18)   Once all changes have been made to the link table click EXPORT TO DBASE FORMAT and then click UPDATE PAT/AAT FROM EXPORT. Scroll through the status column to check for errors. The most common error is incorrect syntax between the database and the link table PIDs or having two PIDs with the same POLYGON ID,

(19)   Follow the steps outlined in **Displaying pavement data using ArcVIEW© and checking for errors.**

Viewing Workplans and Condition Analyses in ArcVIEW©

This section describes the process of using PAVER GIS to add information from PAVER workplans and condition analyses to the coverage's PAT file. Once complete, this information can be displayed on the coverage using a program such as ArcVIEW©.

(1)   In PAVERGIS check the box for Work Plan / Condition History, then click the "Select" button to the right to locate the *.rpw / *.rpc file. (Be sure to select the proper PAVER data and coverage from the pull-down menus at the top.)

(2)   Click the "Export to dBase Format" button, then click the "Update PAT/AAT from Export" button. (Note: the "Update Link" and "Initialize" boxes do not have to be checked if the data in the link table has not been edited. Leaving these boxes unchecked will reduce the update time considerably.)

(3)   Open the project's .apr file in ArcView. (See **Creating an ArcVIEW© project** to set up a new project.) Open the Condition History view or any of the Workplan views to display the information by year.

In the "Condition History" view, the pavement condition for each section can be displayed for as many years as the condition history was run in PAVER. Check the box to the left of any year to view the condition for that year. If more than one year is checked, the "theme" on top will be the only one displayed.

In the "Workplan – Condition by Year" view, the pavement condition for each section can be displayed for as many years as the workplan was run in PAVER. (Note: only information from one workplan can be displayed at a time. In order to display information from another workplan, close ArcView, open PAVERGIS and repeat steps 1-3 above.)

In the "Workplan Maintenance – Major (All)" view, maintenance activities that are planned for a particular year can be displayed. A pavement section receiving maintenance will be colored according to it being above or below the critical PCI of 55. Pavement sections not receiving maintenance will remain uncolored.

Glossary

Branches – a readily identifiable part of the pavement network that has a distinct function. For example, individual roads or parking lots are normally considered branches. A branch may be composed of one or more sections.

CAD – Computer added design: Visual creation and monipulation of a drawing on a computer screen.

Clean command – Generates polygon topology, edits and corrects geometric coordinate errors, assembles lines into polygon features, and creates feature attribute information for each polygon. (Source: ESRI ArcCAD© command reference manual)

Condition analyses – The process of forecasting future pavement condition using pavement family models.

Coverage – A Coverage represents the basic unit of a GIS data set. It contains both the map feature items (i.e., polygons) and map feature attributes (i.e., PID, area, branch use, etc).

Feature – the real world phenomena that are represented. In this case each closed area of an electronic map that represents a section of a paving area, such as street, is considered a feature. A feature corresponds to the graphical representation of the Micro PAVER section within the GIS map.

GIS – Geographic information system: a computer-based information system that allows for the manipulation and analysis of geographically referenced. GIS allows for the graphical display of such data based apon specific constrains or queries decided by the user.

Linktable – the table in the PAVER/GIS Interface (Data Preperation Export/Import) screen is used to link the database PIDs with their coresponding polugon identification number from the coverage.

Network – A group of pavements that will usually be managed together.

Noderror – used in ArcCAD© to display potential node errors in the coverage. (Source: ESRI ArcCAD© command reference manual)

PID – Pavement Identification: the full name given to a specific pavement element in the Micro PAVER database denoted by network, branch, and section.

Sections – the smallest management unit when considering the application of major maintenance and repair. Factors to consider when dividing a branch into sections include pavement structure, traffic, construction history, and pavement rank (or functional classification).

Theme – A collection of geographical features with user defined common characteristics (i.e., streets, parking lots, or airfields. For our use, all paving elements are grouped into a common theme)

Workplans – The process of forecasting future network pavement condition by applying user-defined maintenance and repair costs and budget scenarios.

References

Environmental Systems Research Institute, Inc. ArcCAD Command Reference, Copyright 1995.

Environmental Systems Research Institute, Inc. ArcCAD Users Guide, Copyright 1995.

Environmental Systems Research Institute, Inc. homepage: http://www.esri.com/index.html

Autodesk, Inc. AutoCAD R14 User's Guide, Copyright 1998.

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Appendix B

Inspection Information File Format (*Standard and Extended Formats*)

The following description is based on a "Card" model, where the "Cards" are now represented by lines in a text file. Files are in ASCII text, fixed width format. *Note: Micro PAVER 4.1 and later support the extended branch and section number fields.*

07 (AC or GR) and 10 (PCC) Card Format

These cards contain section header information and supplemental inspection. One card required per section inspected.

Field Name	Format	Columns - Standard	Columns - Extended
Form ID	Numeric	1-2	1-2
Inspection Date	MMDDYY	3-8	3-8
Branch Number	Alpha-Numeric	9-13	9-18
Section Number	Alpha-Numeric	14-16	19-28
Add/Change/Delete	Alpha-Numeric	17	29
Riding	Alpha-Numeric	18-20	30-32
Safety	Alpha-Numeric	21-23	33-35
Drainage	Alpha-Numeric	24-26	36-38
Shoulder	Alpha-Numeric	27-29	39-41
Overall	Alpha-Numeric	30-32	42-44
FOD	Alpha-Numeric	33-35	45-47
Total No. of Samples in Section	Numeric	36-38	48-50

Select * from [Plan Parameters]

08 (AC or GR) and 11 (PCC) Card Format

These cards contain sample unit and distress information. One or more cards are required per sample unit inspected and can contain up to four distresses per card. (I.E. A separate card may be used for each distress.) *nnnnn.nn is a decimal number*

Field Name	Format	Columns - Standard	Columns - Extended
Form ID	Numeric	1-2	1-2
Inspection Date	MMDDYY	3-8	3-8
Branch Number	Alpha-Numeric	9-13	9-18
Section Number	Alpha-Numeric	14-16	19-28
Add/Change/Delete	Alpha-Numeric	17	29
Sample Unit ID	Alpha-Numeric	18-20	30-32
Sample Type	Alpha-Numeric	21	33
Area/ No. of Slabs in Sample	nnnnn.nn	22-29	34-41
Distress Code	Numeric	30-31	42-43
Severity	Alpha-Numeric	32	44
Quantity	nnnnn.nn	33-40	45-52
Distress Code	Numeric	41-42	53-54
Severity	Alpha-Numeric	43	55
Quantity	nnnnn.nn	44-51	56-63
Distress Code	Numeric	52-53	64-65
Severity	Alpha-Numeric	54	66
Quantity	nnnnn.nn	55-62	67-74
Distress Code	Numeric	63-64	75-76
Severity	Alpha-Numeric	65	77
Quantity	nnnnn.nn	66-73	78-85

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Appendix C-1

Video Inspection Import Data Format (ASCII Text)

File Specifications for PCIVideo Interface to PAVER

Example User Interfaces

PCIVasc2PVR.exe

User interface for the use of Distress Data collected into ASCII files. It is recommended that the complete parameter string be enclosed in quotes ("").

Command Line Parameters:
```
PVR=C:\EMS Program Files\
PDIR=C:\EMS Program Files\User Data\Sample\     Directory containing the PAVER PAVEMENT.MDB
IDIR=C:\EMS Program Files\PCIVideo             Directory containing the ASCII text files
INSP=PCIVInspection.txt                        File containing Inspection information
SAMP=PCIVSample.txt                            File containing Sample information
FRAM=PCIVFrame.txt                             File containing Frame information
DIST=PCIVDistress.txt                          File containing Distress information
COND=PCIVCondition.txt                         File containing Condition information
OPTN=PCIVOptions.txt                           File containing PCIVideo options
INTERACTIVE                                    If present, force display of  UI
```

PCIVdb2PVR.exe

User interface for the use of Distress Data collected into an pre-configured Access database. It is recommended that the complete parameter string be enclosed in quotes ("").

Command Line Parameters:
```
PVR=C:\EMS Program Files\
PDIR=C:\EMS Program Files\User Data\Sample\     Directory containing the PAVER PAVEMENT.MDB
IDIR=C:\EMS Program Files\PCIVideo             Directory containing PCIVIntermediateFile.mdb
INTERACTIVE                                    If present, force display of  UI
```

Six text files are needed to perform an import of video inspection data.
The following file formats support the import of collected frame distress data.
- Fields are separated by commas
- Strings are enclosed by quotes
- Dates are enclosed by pound signs
- Network, Branch, and Section are separated by 2 colons
- Optional fields may be blank but present

PCIVideoOptions.txt

```
Line 1:
FieldA,FieldB,FieldC
"Metric","Data collected in contract #xxx","PID"

Line 2..n: (Optional)
FieldA
Spacer:00000
DEFAULTFRAMESIZE:260
DEFAULTFRAMEUNITS:SQF
```

Where:

Line 1:

FieldA

Data values were collected in "English" or "Metric"

FieldB

Comment to associate with the execution of this process.

FieldC

Method of data association (UniqueId / PID / SID)

PCIVideoInspection.txt

```
FieldA,FieldB,FieldC,FieldD,FieldE
"RSPARK::IFARB:01",#6/5/2000#,"optional",4,"optional"
```

Where:

FieldA

The identifier of the section which "owns" this inspection
NETWORKID::BRANCHID::SECTIONID
SPACER

FieldB

Identifies the date common to all data from this inspection (multi-day inspections just pick a day)

FieldC

Usually some observations resulting from inspection.

FieldD

How many samples in the inspection.

FieldE

Indicates the origin of the inspection data

PCIVideoSample.txt

```
FieldA,FieldB,FieldC,FieldD,FieldE,FieldF,FieldG
"RSPARK::IFARB:01",#6/5/2000#,"1SMP2","R",52.95,"SqM","Sample Comment"
```

Where:

FieldA

The identifier of the section which "owns" this inspection
NETWORKID::BRANCHID::SECTIONID
SPACER

FieldB

Identifies the date common to all data from this inspection (multi-day inspections just pick a day)

FieldC

Assigned by video vendor for this video sample (must be unique within section and inspection date)

FieldD

Size of Sample

FieldE

    Unit of measure (as defined in PAVER) for the Sample Size

FieldF

    Survey or Detail Comment regarding Sample

PCIVideoFrame.txt

```
FieldA,FieldB,FieldC,FieldD,FieldE,FieldF,FieldG,FieldH,FieldI,FieldJ
"RSPARK::IFARB:01",#6/5/2000#,"1FRM2","",52.95,"SqM","START","END","LATITUTE","LONGITUDE"
```

Where:

FieldA

    The identifier of the section which "owns" this inspection
    NETWORKID::BRANCHID::SECTIONID
    SPACER

FieldB

    Identifies the date common to all data from this inspection (multi-day inspections just pick a day)

FieldC

    Assigned by video vendor Identifier for this video frame (must be unique within section and inspection date)

FieldD

    Identifies this sample (optional)

FieldE

    Size of Frame

FieldF

    Unit of measure (as defined in PAVER) for the Frame Size

FieldG

    Distance from start of film to begin of inspection frame (optional)

FieldH

    Distance from start of film to end of inspection frame (optional)

FieldI

    LATITUTE-GPS String of Degree, Minutes, Seconds (optional)

FieldJ

    LONGITUDE -GPS String of Degree, Minutes, Seconds (optional)

PCIVideoDistress.txt

```
FieldA,FieldB,FieldC,FieldD,FieldE,FieldF,FieldG,FieldH,FieldI,FieldJ
"RSPARK::IFARB:01",#6/5/2000#,"","1FRM2", 7 ,"H", 1.46304001808166 ,"M","EDGE  CRACKING"
```

Where:

FieldA

    The identifier of the section which "owns" this inspection
    NETWORKID::BRANCHID::SECTIONID
    SPACER

FieldB

    Identifies the date common to all data from this inspection (multi-day inspections just pick a day)

FieldC

    Sample number which owns this distress (if any)

FieldD

    Assigned by video vendorIdentifier for this video frame (must be unique within section and inspection date)

FieldE

    The distress code as used in PAVER (integer)

FieldF

H, M, L (if severity is used for the given distess code)

FieldG

The quantity of the distress (for Distress numbers with quantity defined)

FieldH

Unit of measure (as defined in PAVER) for the quantity

FieldI

Available for any comment/observation by the data collector (optional)

PCIVideoCondition.txt

```
FieldA,FieldB,FieldC,FieldD,FieldE,FieldF,FieldG,FieldH
"RSPARK::IFARB:01",#6/5/2000#,"","", 21 ,"","IRI","Automated data collection"
```

Where:

FieldA

The identifier of the section which "owns" this inspection
NETWORKID::BRANCHID::SECTIONID
SPACER

FieldB

Identifies the date common to all data from this inspection (multi-day inspections just pick
a day)

FieldC

Sample number which owns this distress (if any)

FieldD

Assigned by video vendorIdentifier for this video frame (must be unique within section and
inspection date)

FieldE

The Numeric Condition value to be recorded.
Only populate FieldE or FieldF as determined by the data type for the Condition Method.

FieldF

The Textural Condition value to be recorded.

FieldG

The Condition Method (IRI / PCI / PCIV / etc.)

FieldH

Source of the Condition value. (optional)

Units of Measure valid for PCIVideo

UNIT	System
F	English
FT	English
LF	English
SF	English
SQF	English
SQFT	English
M	Metric
SM	Metric
SQM	Metric
COUNT	Metric or English
SLAB	Metric or English
SLABS	Metric or English

Appendix C-2

Video Inspection Import Data Format (Access Database)

There are five data tables that can be created in Microsoft Access to input data. They include the following:

- **PCIVideoDistress**

- **PCIVideoCondition**

- **PCIVideoInspection**

- **PCIVideoSample**

- **PCIVideoFrame**

At least one of the two tables in bold type are required. Optional tables can be used to record additional descriptive data if available. In general, data values that have been filled in are required and those listed as optional can be omitted.

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Appendix D

Abbreviations of Surface Types

Abbreviation	Complete Name	Distress Manual Reference
AAC	Asphalt overlay over asphalt concrete	Asphalt
ABR	Asphalt over brick	Asphalt
AC	Asphalt concrete	Asphalt
ACT	Asphalt over cement treated base	Asphalt
APC	Asphalt overlay over Portland cement concrete	Asphalt
APZ	Asphalt over pozzolanic base	Asphalt
BR	Brick	Asphalt
COB	Cobblestone	Asphalt
GR	Gravel	Unsurfaced
PCC	Portland cement concrete	Concrete
PVB	Paving blocks	Asphalt
ST	Surface treatment	Asphalt
X	Other	Unsurfaced

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Appendix E

Pavement Data Exchange (PDE) Format

	OBJECT NAME	DATA TYPE	DATA SIZE	USAGE
Table	SITE			SITE.DBF (PAVER Database and Contact Information)
Field	AGENCY	Text	61	PAVER Agency responsible for data maintenance
Field	SECUR	Text	25	*INTERNAL USE* *VALUE NOT REQUIRED*
Field	UNIT	Text	7	Data units in "ENGLISH" or "METRIC"
Field	NAME	Text	25	PAVER Data Coordinator Name
Field	ADDR	Text	52	PAVER Data Coordinator Address
Field	CTYSTA	Text	30	PAVER Data Coordinator City and State
Field	ZIPCDE	Text	10	PAVER Data Coordinator Zip Code
Field	PHONE	Text	21	PAVER Data Coordinator Phone Number
Field	PASSWRD	Text	8	*INTERNAL USE* *VALUE NOT REQUIRED*
Field	AGENCYID	Text	5	PAVER Agency Id
Table	FAMILY			FAMILY.DBF (Family Models)
Field	FAMILY	Text	20	Model name.
Field	MAXAGE	Number (Double)	8	Max age to be used for model.
Field	COEFF1	Number (Double)	8	Model 1st coefficient.
Field	COEFF2	Number (Double)	8	Model 2nd coefficient.
Field	COEFF3	Number (Double)	8	Model 3rd coefficient.
Field	COEFF4	Number (Double)	8	Model 4th coefficient.
Table	POLICY1			POLICY1.DBF (Maintenance Policy Names)
Field	POLICY	Number (Double)	8	Maintenance policy Id
Field	DESCRIPT	Text	30	Description of maintenance policy
Table	POLICY2			POLICY2.DBF (Maintenance Policy Details)
Field	POLICY	Number (Double)	8	Maintenance policy Id
Field	DISTRESS	Number (Double)	8	Distress for policy consideration
Field	SEVERITY	Text	1	Distress severity for policy consideration
Field	WORKTYPE	Text	5	Work type considered for distress and severity
Field	MATERIAL	Number (Double)	8	Material type considered for distress and severity
Field	EXTRA1	Number (Double)	8	*INTERNAL USE* *VALUE NOT REQUIRED*
Field	EXTRA2	Number (Double)	8	*INTERNAL USE* *VALUE NOT REQUIRED*
Field	UNITCOST	Number (Double)	8	Cost per work type unit
Table	NETWORK			NETWORK.DBF (Pavement Network Inventory)
Field	NETWORK	Text	10	Large group of pavements. Usually Airport, City, Sub-Division Identifier
Field	NAME	Text	61	Description of pavement network.
Field	NSORT1	Text	10	Supplemental value for selecting networks
Field	NSORT2	Text	10	Supplemental value for selecting networks
Field	NSORT3	Text	10	Supplemental value for selecting networks

OBJECT NAME		DATA TYPE	DATA SIZE	USAGE
Table	BRANCH			BRANCH.DBF (Pavement Branch Inventory)
Field	NETWORK	Text	10	Large group of pavements. Usually Airport, City, Sub-Division Identifier
Field	BRANCH	Text	10	Medium grouping of pavements. Usually runway, taxiway, apron, street name.
Field	NAME	Text	25	Description of pavement branch.
Field	USE	Text	10	Branch use. ROADWAY, APRON, RUNWAY, TAXI WAY, Etc.
Field	SECTIONS	Number (Double)	8	Number of pavement sections in the branch.
Field	AREA	Number (Double)	8	Total area of all sections in the branch.
Field	COMMENTS	Text	70	Any additional comments about the branch.
Field	BSORT1	Text	10	Supplemental value for selecting branches
Field	BSORT2	Text	10	Supplemental value for selecting branches
Field	BSORT3	Text	10	Supplemental value for selecting branches
Table	SECTION			SECTION.DBF (Pavement Section Inventory)
Field	NETWORK	Text	10	Large group of pavements. Usually Airport, City, Sub-Division Identifier
Field	BRANCH	Text	10	Medium grouping of pavements. Usually runway, taxiway, apron, street name.
Field	SECTION	Text	10	Area of same pavement type. This is the unit of pavement used for inspection rating methods.
Field	FROM	Text	25	Starting location of pavement section
Field	TOO	Text	25	Ending location of pavement section
Field	ZONE	Text	4	User specified indicator for funding sources, maintenance areas, etc.
Field	CATEGORY	Text	1	Section category (A-Z, 0-9)
Field	RANK	Text	1	Pavement rank (A=Principal, B=Arterial, C=Collector, D=Industrial, E=Residential, N=Not Applicable, P=Primary, S=Secondary, T=Tertiary, X=Other)
Field	SURFACE	Text	10	Surface type (AAC, ABR, AC, ACT, APC, APZ, BR, COB, GR, PCC, PVB, ST, X)
Field	SECLEN	Number (Double)	8	Section Length
Field	SECWID	Number (Double)	8	Section Width
Field	SECAREA	Number (Double)	8	Section Area
Field	SLABLEN	Number (Double)	8	Slab length
Field	SLABWID	Number (Double)	8	Slab width
Field	NUMSLAB	Number (Double)	8	Number of slabs
Field	JOINTLEN	Number (Double)	8	Slab joint length
Field	LCD	Date/Time	8	Last construction date
Field	LID	Date/Time	8	Last inspection date
Field	LPCI	Number (Double)	8	Last inspection PCI condition
Field	FAMILY	Text	8	Family model assigned to section
Field	SHOULDER	Text	3	Shoulder type
Field	STRTYPE	Text	3	Street type
Field	GRADE	Number (Double)	8	Pavement grade in degrees
Field	LANES	Number (Double)	8	Number of lanes in section
Field	SSORT1	Text	10	Supplemental value for selecting sections
Field	SSORT2	Text	10	Supplemental value for selecting sections
Field	SSORT3	Text	10	Supplemental value for selecting sections

OBJECT NAME		DATA TYPE	DATA SIZE	USAGE
Table	SAMPLE			SAMLE.DBF (Inspection Sample Details)
Field	NETWORK	Text	10	Large group of pavements. Usually Airport, City, Sub-Division Identifier
Field	BRANCH	Text	10	Medium grouping of pavements. Usually runway, taxiway, apron, street name.
Field	SECTION	Text	10	Area of same pavement type. This is the unit of pavement used for inspection rating methods.
Field	INSDAT	Date/Time	8	Date of inspection.
Field	SAMPLE	Text	10	Sample Id
Field	TYPE	Text	1	Sample type R=Random A=Additional
Field	SIZE	Number (Double)	8	Sample size, area or slabs
Field	PCI	Number (Double)	8	Sample PCI Condition
Field	DISTRESS	Number (Double)	8	Distress code
Field	SEVERITY	Text	1	Distress severity
Field	QTY	Number (Double)	8	Quantity of distress
Table	XDIST			XDIST.DBF (Inspection Extrapolated Distress Information)
Field	NETWORK	Text	10	Large group of pavements. Usually Airport, City, Sub-Division Identifier
Field	BRANCH	Text	10	Medium grouping of pavements. Usually runway, taxiway, apron, street name.
Field	SECTION	Text	10	Area of same pavement type. This is the unit of pavement used for inspection rating methods.
Field	INSDAT	Date/Time	8	Date of inspection.
Field	DISTRESS	Number (Double)	8	Distress code
Field	SEVERITY	Text	1	Distress severity
Field	QTY	Number (Double)	8	Quantity of distress
Field	DENSITY	Number (Double)	8	Density of distress for severity
Field	DEDUCT	Number (Double)	8	PCI points to deduct for this distress for severity
Table	CONDHIST			CONDHIST.DBF (Inspection Summary Results)
Field	NETWORK	Text	10	Large group of pavements. Usually Airport, City, Sub-Division Identifier
Field	BRANCH	Text	10	Medium grouping of pavements. Usually runway, taxiway, apron, street name.
Field	SECTION	Text	10	Area of same pavement type. This is the unit of pavement used for inspection rating methods.
Field	INSDAT	Date/Time	8	Date of inspection.
Field	RIDE	Text	3	Condition rating: Ride Quality
Field	SAFETY	Text	3	Condition rating: Safety
Field	DRAIN	Text	3	Condition rating: Drainage Condition
Field	SHOULDER	Text	3	Condition rating: Shoulder Quality
Field	OVERALL	Text	3	Condition rating: Overall Condition
Field	FOD	Text	3	Condition rating: Foreign Object Damage
Field	SAMPLES	Number (Double)	8	Samples in section
Field	SAMPLE	Number (Double)	8	Samples in section
Field	PCI	Number (Double)	8	Condition rating: PCI
Field	RANDOM	Number (Double)	8	Random samples in section
Field	ADDITION	Number (Double)	8	Additional samples in section
Field	MINSAM	Number (Double)	8	Minimum number of samples recommended for section
Field	PCISTA	Number (Double)	8	*INTERNAL USE* *VALUE NOT REQUIRED*
Field	LOAD	Number (Double)	8	Percent of distress due to: LOAD
Field	CLIMATE	Number (Double)	8	Percent of distress due to: CLIMATE
Field	OTHER	Number (Double)	8	Percent of distress due to: OTHER

	OBJECT NAME	DATA TYPE	DATA SIZE	USAGE
Table	TRAFFIC			TRAFFIC.DBF (Traffic survey Details)
Field	NETWORK	Text	10	Large group of pavements. Usually Airport, City, Sub-Division Identifier
Field	BRANCH	Text	10	Medium grouping of pavements. Usually runway, taxiway, apron, street name.
Field	SECTION	Text	10	Area of same pavement type. This is the unit of pavement used for inspection rating methods.
Field	SURVEY	Date/Time	8	Starting date of traffic survey
Field	AIRTYPE	Text	15	(Airfields) Aircraft model
Field	ANNDEP	Number (Double)	8	(Airfields) Annual number of departures
Field	AVDAILY	Number (Double)	8	(Airfields) Average number of daily departures
Field	PERDESGN	Number (Double)	8	(Roadways) Percent of traffic in design lane
Field	PER2AT	Number (Double)	8	(Roadways) Percent of twin axle trucks in design lane
Field	PER3AT	Number (Double)	8	(Roadways) Percent of trucks with 3 or more axles in design lane
Field	ESAL	Number (Double)	8	(Roadways) Annual ESAL in design lane
Field	COMMENT	Text	70	Comments related to traffic survey
Field	ENDDATE	Date/Time	8	Ending date of traffic survey
Table	MATPRO			MATPRO.DBF (Layer and Materials Testing Details)
Field	NETWORK	Text	10	Large group of pavements. Usually Airport, City, Sub-Division Identifier
Field	BRANCH	Text	10	Medium grouping of pavements. Usually runway, taxiway, apron, street name.
Field	SECTION	Text	10	Area of same pavement type. This is the unit of pavement used for inspection rating methods.
Field	LAYER	Text	10	Layer type: OVERLAY, SURFACE, BASE, SUBBASE, SUBGRADE
Field	TESTTYPE	Text	50	Test type
Field	TESTDATE	Date/Time	8	Date of test
Field	TESTLOC	Text	10	Location of test
Field	TESTVAL	Text	10	Result value of test
Field	DEPTH	Number (Double)	8	Depth from layer surface
Field	COMMENT	Text	70	Comments related to Material Test
Table	WORREQ			WORKREQ.DBF (Pavement Work Required Details)
Field	NETWORK	Text	10	Large group of pavements. Usually Airport, City, Sub-Division Identifier
Field	BRANCH	Text	10	Medium grouping of pavements. Usually runway, taxiway, apron, street name.
Field	SECTION	Text	10	Area of same pavement type. This is the unit of pavement used for inspection rating methods.
Field	WORKTYPE	Text	5	Work type code
Field	STADATE	Date/Time	8	Date to start project
Field	IDDATE	Date/Time	8	Proposed date to start project
Field	PROPOSAL	Text	12	Proposal Id
Field	PHASE	Text	2	Project phase
Field	ACCOMP	Text	1	Manner Accomplished I=Inhouse C=Contractor
Field	QTY	Number (Double)	8	Quantity of work type to be performed
Field	COST	Number (Double)	8	Cost based on work type and quantity
Field	MATERIAL	Number (Double)	8	Material type used for work type
Field	THICK	Number (Double)	8	Thickness of material
Field	COMMENT	Text	70	Comments related to project

	OBJECT NAME	DATA TYPE	DATA SIZE	USAGE
Table	WORKHIST			WORKHIST.DBF (Pavement Work History Details)
Field	NETWORK	Text	10	Large group of pavements. Usually Airport, City, Sub-Division Identifier
Field	BRANCH	Text	10	Medium grouping of pavements. Usually runway, taxiway, apron, street name.
Field	SECTION	Text	10	Area of same pavement type. This is the unit of pavement used for inspection rating methods.
Field	WORKTYPE	Text	5	Work type code
Field	COMPLETE	Date/Time	8	Date work completed
Field	MATERIAL	Number (Double)	8	Material type used for work type
Field	THICK	Number (Double)	8	Thickness of material
Field	ACCOMP	Text	1	Manner Accomplished I=Inhouse C=Contractor
Field	QTY	Number (Double)	8	Quantity of work type to be performed
Field	COST	Number (Double)	8	Cost based on work type and quantity
Field	COMMENT	Text	70	Comments related to project
Field	STADATE	Date/Time	8	Date project started
Field	IDDATE	Date/Time	8	Proposed date to start project
Field	PROPOSAL	Text	12	Proposal Id
Field	PHASE	Text	2	Project phase
Table	NDT1			NDT1.DBF (FWD Testing Summary)(Not imported into PAVER 4.0)
Field	NETWORK	Text	10	Large group of pavements. Usually Airport, City, Sub-Division Identifier
Field	BRANCH	Text	10	Medium grouping of pavements. Usually runway, taxiway, apron, street name.
Field	SECTION	Text	10	Area of same pavement type. This is the unit of pavement used for inspection rating methods.
Field	LOCATION	Number (Double)	8	Area tested. (Center, Wheel Path, Edge Loading, Corner, Etc.)
Field	STATION	Number (Double)	8	Station number tested
Field	TESTDATE	Date/Time	8	Date of testing
Field	TEMP	Number (Double)	8	Air temperature
Field	LOAD	Number (Double)	8	Test load in kilograms
Field	MAXDEF	Number (Double)	8	Maximum deflection in mils
Field	TRANSFER	Number (Double)	8	Load transfer in percent
Field	TESTTYPE	Text	1	NDT type: D=Design, A=Average
Table	NDT2			NDT2.DBF (FWD Testing Detail)(Not imported into PAVER 4.0)
Field	NETWORK	Text	10	Large group of pavements. Usually Airport, City, Sub-Division Identifier
Field	BRANCH	Text	10	Medium grouping of pavements. Usually runway, taxiway, apron, street name.
Field	SECTION	Text	10	Area of same pavement type. This is the unit of pavement used for inspection rating methods.
Field	LOCATION	Number (Double)	8	Area tested. (Center, Wheel Path, Edge Loading, Corner, Etc.)
Field	STATION	Number (Double)	8	Station number tested
Field	TESTDATE	Date/Time	8	Date of testing
Field	TEMP	Number (Double)	8	Air temperature
Field	LOAD	Number (Double)	8	Test load in kilograms
Field	SENSOR	Number (Double)	8	Sensor measured
Field	DISTANCE	Number (Double)	8	Sensor distance from load
Field	DEFLECT	Number (Double)	8	Sensor deflection in mils

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Appendix F

Example Pavement Survey Forms

Included on the following pages are some example forms for surveying asphalt and concrete pavements. The four example forms are:

- Asphalt Surfaced Roads and Parking Lots

- Concrete Surfaced Roads and Parking Lots

- Airfield Asphalt Pavement

- Airfield Concrete Pavement

Asphalt Surfaced Roads and Parking Lots

ASPHALT SURFACED ROADS AND PARKING LOTS CONDITION SURVEY DATA SHEET FOR ONE SAMPLE UNIT BRANCH_____ SECTION_____ SAMPLE UNIT_____ SURVEYOR_____ DATE_____ SAMPLE AREA_____			SKETCH	
1. Alligator (SF) *Cracking*	2. Bleeding (SF)	*3. Block Cracking (SF)*	4. Bumps and Sags (LF)	5. Corrugation (SF)
6. Depression (SF)	*7. Edge Cracking (LF)*	8. Joint Reflection (LF) Cracking	9. Lane/Shoulder (LF) Drop Off	*10. Long. and Trans. (LF)* *Cracking*
11. Patching and Util. (SF) *Cut Patching*	12. Polished (SF) Aggregate	13. Potholes (CNT)	14. Railroad Crossing (SF)	*15. Rutting (SF)*
16. Shoving (SF)	17. Slippage Cracking (SF)	18. Swell (SF)	19. Weathering and (SF) Raveling	**COMMENTS**

(Enlarge 1.33x to Fit 8.5x11")

Concrete Surfaced Roads and Parking Lots

CONCRETE SURFACED ROADS AND PARKING LOTS
CONDITION SURVEY DATA SHEET FOR ONE SAMPLE UNIT

BRANCH_____ SECTION_____ SAMPLE UNIT_____

SURVEYOR_____ DATE_____ NO. OF SLABS_____

DISTRESS TYPES

21. Blow-up/Buckling
22. Corner Break
23. Divided Slab
24. Durability Cracking
25. Faulting
26. Joint Seal
27. Lane/Shoulder
28. Linear Cracking
29. Patching (Large)
30. Patching (Small)
31. Polished Aggregate
32. Popouts
33. Pumping
34. Punchout
35. Railroad Crossing
36. Scaling
37. Shrinkage Cracking
38. Spalling, Corner
39. Spalling, Joint

DIST. TYPE	SEVERITY	NO. SLABS
26		

SKETCH

(Enlarge 1.1x to Fit 8.5x11")

Airfield Asphalt Pavement

<table>
<tr><td colspan="5">AIRFIELD ASPHALT PAVEMENT
CONDITION SURVEY DATA SHEET FOR ONE SAMPLE UNIT

BRANCH_____ SECTION_____ SAMPLE UNIT_____
SURVEYOR_____ DATE_____ SAMPLE AREA_____</td><td colspan="2">SKETCH</td></tr>
<tr><td><i>41. Alligator (SF)
Cracking</i></td><td>42. Bleeding (SF)</td><td colspan="2"><i>43. Block Cracking (SF)</i></td><td>44. Corrugation (SF)</td><td colspan="2">45. Depression (SF)</td></tr>
<tr><td></td><td></td><td colspan="2"></td><td></td><td colspan="2"></td></tr>
<tr><td>46. Jet Blast (SF)</td><td><i>47. Joint Reflection (LF)
Cracking</i></td><td colspan="2"><i>48. Long. and Trans. (LF)
Cracking</i></td><td>49. Oil Spillage (SF)</td><td colspan="2"><i>50. Patching (SF)</i></td></tr>
<tr><td></td><td></td><td colspan="2"></td><td></td><td colspan="2"></td></tr>
<tr><td>51. Polished (SF)
Aggregate</td><td>52. Weathering (SF)
and Raveling</td><td colspan="2">53. Rutting (SF)</td><td>54. Shoving (SF)
from PCC</td><td colspan="2">55. Slippage (SF)
Cracking</td></tr>
<tr><td></td><td></td><td colspan="2"></td><td></td><td colspan="2"></td></tr>
<tr><td>56. Swell (SF)</td><td>COMMENTS</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

(Enlarge 1.33x to Fit 8.5x11")

Airfield Concrete Pavement

AIRFIELD CONCRETE PAVEMENTS
CONDITION SURVEY DATA SHEET FOR ONE SAMPLE UNIT

BRANCH_____ SECTION_____ SAMPLE UNIT_____

SURVEYOR_____ DATE_____ NO. OF SLABS_____

DISTRESS TYPES

61. Blow-up/Buckling	69. Pumping
62. Corner Break	70. Scaling/Map Cracking
63. Long./Trans./	Crazing
Diag. Cracking	71. Settlement/Faulting
64. Durability Cracking	72. Shattered Slab
65. Joint Seal	73. Shrinkage Cracking
66. Patching < 5 Sqft..	74. Spalling, Joint
67. Patching, Util. Cut	75. Spalling, Corner
68. Popouts	

DIST. TYPE	SEVERITY	NO. SLABS
65		

SKETCH

(Enlarge 1.1x to Fit 8.5x11")

Unsurfaced Roads

UNSURFACED ROADS CONDITION SURVEY DATA SHEET FOR ONE SAMPLE UNIT			SKETCH	
BRANCH_____ SECTION_____ SAMPLE UNIT_____ SURVEYOR_____ DATE_____ SAMPLE AREA_____				
1. Improper (LF) Cross Section	2. Inadequate (LF) Roadside Drainage	3. Corrugations (SF)	4. Dust	5. Potholes (CNT)
6. Ruts (SF)	7. Loose (LF) Aggregate	COMMENTS		

(Enlarge 1.33x to Fit 8.5x11")

Appendix G

Load & Climate Distresses

Asphalt Surfaced Roads and Parking Lots

Pavement Distress	Distress Type
1. Alligator Cracking	Load
2. Bleeding	Other
3. Block Cracking	Climate/Durability
4. Bumps & Sags	Other
5. Corrugation	Other
6. Depression	Other
7. Edge Cracking	Load
8. Joint Reflection Cracking	Climate/Durability
9. Lane/Shoulder Drop Off	Other
10. Longitudinal/Transverse Cracking	Climate/Durability
11. Patch/Utility Cut	Other
12. Polished Aggregate	Other
13. Pothole	Load
14. Railroad Crossing	Other
15. Rutting	Load
16. Shoving	Other
17. Slippage Cracking	Other
18. Swell	Other
19. Weathering/Raveling	Climate/Durability

Concrete Surfaced Roads and Parking Lots

Pavement Distress	Distress Type
21. Blow Up	Climate/Durability
22. Corner Break	Load
23. Divided Slab	Load
24. Durability Cracking	Climate/Durability

Pavement Distress	Distress Type
25. Faulting	Other
26. Joint Seal Damage	Climate/Durability
27. Lane/Shoulder Drop Off	Other
28. Linear Cracking	Load
29. Large Patch/Utility Cut	Other
30. Small Patch	Other
31. Polished Aggregate	Other
32. Popouts	Other
33. Pumping	Other
34. Punchout	Load
35. Railroad Crossing	Other
36. Scaling/Crazing	Other
37. Shrinkage Cracking	Climate/Durability
38. Corner Spalling	Climate/Durability
39. Joint Spalling	Climate/Durability

Asphalt Surfaced Airfields

Pavement Distress	**Distress Type**
41. Alligator Cracking	Load
42. Bleeding	Other
43. Block Cracking	Climate/Durability
44. Corrugation	Other
45. Depression	Other
46. Jet Blast	Other
47. Joint Reflection Cracking	Climate/Durability
48. Longitudinal/Transverse Cracking	Climate/Durability
49. Oil Spillage	Other
50. Patching	Climate/Durability
51. Polished Aggregate	Other
52. Weathering/Raveling	Climate/Durability
53. Rutting	Load
54. Shoving	Other
55. Slippage Cracking	Other
56. Swell	Other

Concrete Surfaced Airfields

Pavement Distress	Distress Type
61. Blow Up	Climate/Durability
62. Corner Break	Load
63. Linear Cracking	Load
64. Durability Cracking	Climate/Durability
65. Joint Seal Damage	Climate/Durability
66. Small Patch	Other
67. Large Patch/Utility Cut	Other
68. Popouts	Other
69. Pumping	Other
70. Scaling/Crazing	Other
71. Faulting	Other
72. Shattered Slab	Load
73. Shrinkage Cracking	Other
74. Joint Spalling	Other
75. Corner Spalling	Other

Unsurfaced Roads

Pavement Distress	Distress Type
81. Improper Cross Section	Other
82. Inadequate Roadside Drainage	Other
83. Corrugation	Climate/Durability
84. Dust	Other
85. Pothole	Climate/Durability
86. Rutting	Climate/Durability
87. Loose Aggregate	Other

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Appendix H

Micro PAVER Network Installation

There are two methods for using Micro PAVER in a networked environment. The two methods vary based on the labor involved in setting up the system, and the capabilities of the network.

Method 1

This method sets up the Micro PAVER software on the network server, allowing up to two users at a time to use the system. However, there are some limitations to this method. Only one user can use certain features of PAVER (i.e. the work plan, condition analysis, and inspection scheduling) at a time. Also, each computer operating the software requires the system files for PAVER. In addition to creating the C:\CERL.ITS\ITS.RUN\PAVER.50\ directory, PAVER installs several files in the C:\WINDOWS\SYSTEM\ directory. These are the files, referred to as system files, required to operate the tables and forms built in PAVER. To obtain the system files, it is necessary to install PAVER on the local machine. Since only the system files are necessary, it is possible to delete the CERL.ITS directory from the local computer that holds the main PAVER program. The main program is executed on the server. PAVER import/export features will not operate with this method. Any use of PAVER import or export features will lock other users out of the system.

Method 2

This method involves installing Micro PAVER on each PC. The databases are then stored on the server. To store the databases on the server, create a directory to house all of the PAVER databases. A local machine which has the database installed will have several files, which need to be moved to the remote pavement database directory. The first file to be installed is in the CERL.ITS/ITS.RUN/PAVER50 directory. The file will be called (database name).pvr and should have a corresponding directory with the name of the database. The directory also needs to be copied to the master pavement database directory on the server. However, the systems files are not transferable, and remain on the local machine. This method will support any number of users. Users can access the same data-base, but PAVER has record-level locking security, which means that no two people can edit the same elements of the database simultaneously. However, this eliminates the conflict of running multiple work plans on the same database, since each user essentially works off of a copy of the original database. The PAVER import/export features do operate on this setup, but any database that is involved in an import/export operation is inaccessible by other users. This method is typically the faster of the two.

Note: The performance of the network systems will be decreased from the stand-alone Micro PAVER.

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Glossary

Check Box

A Microsoft Windows standard user interface item for indicating a user selection. Check boxes are small square items that are displayed in an array for the user to make a selection(s) from. When the mouse is pointing to the check box and the left mouse button is clicked a check mark or 'X" will appear in the check box. Typically check boxes are used when more than one option can be selected from a list.

Critical PCI

Defined as the PCI value at which the rate of PCI loss increases with time, or the cost of applying localized preventive maintenance increases significantly.

Drop Down Menu

A Microsoft Windows standard menu, that is associated with a data entry form or grid. The drop down menu contains a list of the available selections for a data entry field. The drop list is not visible until the field associated with the drop list is selected by the user. When the Field is selected the drop list is activated by clicking the small down arrow located in the far right portion of the field mask. Alternately referred to as a picklist or drop list.

EMS Picture Server

The EMS Picture Tool is an interface for storing images associated with a particular pavement database. Images can be associated with the a network, or assigned to individual branches and sections. It provides a convenient way to establish a pictorial record of database units.

EMS Query

A PAVER for Windows tool used to temporarily select a subset of pavement sections for analysis or reporting. The application of a query to the active database does not cause any records in the database to changed or deleted. The query tool can also be used to specify the sort order of report results.

Family

A pavement "family" is defined as a group of pavement sections with similar deterioration characteristics.   The family model is estimated from the plot of observed age and condition measurements for pavements with similar attributes.

GIS

Geographical Information System (GIS) refers to a system that presents data in the context of a map. GIS can be used to display PAVER inventory, condition, distress, cost and other pavement data as color-coded maps.

Global Preventive Maintenance & Repair (M&R)

Defined as activities applied to entire pavement sections with the primary objective of slowing the rate of deterioration. This policy is applied to pavements above the critical PCI.

Localized Stop-Gap (Safety) Maintenance and Repair

Stopgap M&R is defined as the localized M&R needed to keep the pavement operational in a safe condition. This policy is applied to pavements below the critical PCI.

Localized Preventive M&R

Defined as distress maintenance activities performed with the primary objective of slowing the rate of deterioration. This policy is applied to pavements above the critical PCI.

Major M&R

Activities applied to the entire pavement section to correct or improve existing structural or functional requirements. It is also used to upgrade pavements below the critical PCI.

Modal

A Microsoft Windows form for displaying or collecting information. A modal form must be configured and executed or closed before you can resume other PAVER or Windows tasks.

Parameter Collection Screen

A Microsoft Windows form that is used to configure the PAVER Condition Analysis, Work Plan and Inspection Schedule Reports. The parameter collection screens displays the default settings for the various report parameters that can be configured by the user. In general the values on the form can be adjusted to reflect the desired setting. The parameter collection screen is a modal screen.

PAT

A Polygon Attribute Table (PAT) is a list used by a Geographical Information System (GIS) to relate database information (such as PAVER PCI values) to a GIS map location. In PAVERGIS the PAT is used to describe the sections in a PAVER database. Polygons are used in GIS to represent PAVER features (roads, parking lots, runways, aprons, etc) and then tabular data is attached to the features. A coverage is defined by several files. Some of the files contain graphical information, while others contain table information.

Pavement Condition Index (PCI)

The PCI is the default condition index for the PAVER system. A numerical index, ranging from 0 for a failed pavement to 100 for a pavement in perfect condition. Calculation of the PCI is based on the results of a visual condition survey in which distress type, severity, and quantity are identified. It was developed to provide an index of the pavement's structural integrity and surface operational condition.

Pavement Network

A logical unit for organizing pavements into a structure for the purpose of pavement management. A network will consist of one or more pavement branches, which in turn may consist of one or many pavement sections. The network is the point of origin for the hierarchy of pavement management structures.

Pavement Branch

A branch is a readily identifiable part of the pavement network and has a distinct function. For example, an individual street or a parking lot would each be considered a separate branch of the pavement network. Similarly, an airfield pavement such as a runway or a taxiway would each be considered a separate branch.

Pavement Section

A section should be viewed as the smallest management unit when considering the application and selection of M&R treatments. It is a logical unit assigned to a stretch of pavement that exhibits a common age, construction type, traffic and other criteria. The terminus or leaf point in the hierarchy of defined pavement management structures. A pavement section will be defined as a subordinate of a pavement branch, which in turn will be a subordinate of a parent pavement network.

PAVER Button Bar

The array of eight buttons displayed across the top of the PAVER for Windows Desktop are used to invoke the most used PAVER for Windows features. Each button contains descriptive text and a graphic related to the function of the program the button launches.

PAVERGIS

The program that transfers data from the PAVER (4.1 for Windows and 3.2g) environment to the GIS environment. It facilitates the process of linking pavement database information with representative objects in a GIS coverage.

Picklist

A Microsoft Windows standard menu associated with a data entry form or grid. The picklist menu contains a list of the available selections for a data entry field. The picklist is not visible until the field associated with the picklist is selected by the user. When the Field is selected the picklist is activated by clicking the small down arrow located in the far right portion of the field mask. Alternately referred to as a drop menu or drop list.

PID

Pavement Identification (PID) is the unique combination of pavement inventory information that makes a particular pavement section unique. The PID is formed from the network ID, branch ID and section ID.

Structured Query Language (SQL)

A standard database access language (collection of commands, control clauses, etc) supported by all major database managers. Structured Query Language, or SQL, provides a standard way to get or view information from a database, or put information into a database.

Radio Button

A Microsoft Windows standard user interface item for indicating a user selection. Radio buttons are small circular items that typically displayed in array for the user to make a mutually exclusive selection from.

Report Viewer

A standard PAVER for Windows interface used to display report results. The report viewer presents results as spreadsheet tables with associated graphs where applicable. The Condition Analysis Report, M&R Planning Report, and the Inspection Scheduling Report all present their results in the EMS Report Viewer format.

Right Button Click Feature

Added capabilities available for an object, either a PAVER spreadsheet table or a graph that are accessed by pointing to the object with the mouse and clicking the right mouse button.

Tab Table Data

The common PAVER for Windows data that is edited on Tab Table forms. Tab Table data includes the PAVER User Defined Fields tables, Inventory picklists, Work Plan tables, Materials, and Misc. Other Tables.

Tab Table Form

Microsoft standard form for editing and reviewing data. The Tab Table form simulates index cards that can be selected by pointing to the index tab portion of the card with the mouse and pressing the left mouse button.

User Defined Fields

Discretionary inventory information that can be added to the existing attributes for networks, branches, and sections. A total of nine user defined fields are available, three for each inventory item.

View menu

An item on the PAVER Menu, that is active only when the Report Viewer is the Active Window. The View Menu lists the available tables. Open tables have a check mark to the left of the menu item.

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